Electrical World

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Electrical World

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Weighed in the Balance

DAYLIGHT saving after October will be a thing of the past. Although the act repealing the original measure was twice vetoed by the President, opposition, especially from farmers and the motion-picture industry, was strong enough to induce Congress to pass it over the presidential veto. Those advantages which city dwellers obtained because of more daylight hours for pleasure may still be obtained in some cities through local legislation, and propaganda to that end is now at work. Hence lighting companies in large cities may not benefit from the national enactment. It is singular, however, how the original purpose of daylight saving has been distorted in the popular mind with the connivance of artful propagandists. The purpose of the daylight-saving act was to effect fuel conservation as a war-time economy. A saving of 5 per cent in fuel consumption was claimed, although never proved, and even so small a saving in a period of serious fuel shortage was worth while. The social advantages, however great, which daylight saving made possible were only incidental, and it is regrettable that they should have been so magnified for ulterior purposes. That this war-time legislation, which was harmful to lighting companies, has at last been repealed is a source of gratification to the industry.

Oh for an Abraham Lincoln of industry, who would free the world from slavery to limitation of output, contentment with mediocre daily performance, indifference to the burdens of profiteer victims, and neglect of individual responsibility behind the network of complex organizations!

Engineers on Regulatory Commissions

REGULATORY commissions would undoubtedly be very weak and inefficient institutions if they were without competent engineering advice. Of course they secure the services of engineers, but usually as members of the employed staff. The Engineering Council has advanced in a new quarter the just plea that engineers should be appointed members of the commission, where they will have authority to act as well as to advise. J. Parke Channing, president of the council, has written to President Wilson asking that when a vacancy on the Interstate Commerce Commission is filled consideration be given to the appointment of an engineer. His purpose is expressed as "not to further the interest of any individual or group but solely to serve the nation by strengthening one of its most important regulatory bodies." If the appeal meets with the approval of President Wilson, it will lead to an excellent opportunity for some engineer to prove the usefulness of the profession in this vital branch of public service. Public affairs are very close indeed to private affairs in these times and the best engineering thought and ability of the country is essential to stable progress under the conditions following the end of war. The Engineering Council speaks for a large circle, and its plea is founded, not on selfishness, but on appreciation of the importance of balanced commissions to weigh the problems which touch all ranks.

Shortages in electrical commodities are not without their good side, if not continued too long. They indicate the importance of longer-sightedness on the part of dealer, jobber and manufacturer; frequently lead to a justified enlargement of plant or intensification of production, and stabilize the demand for skilled labor.

A Study of Hydraulic Storage

EXTREMELY striking figures on the hydraulic storage capacity available in New Hampshire have been published in a report of the state commission on the subject. The rivers considered are the Connecticut and the Merrimac with their tributaries, and the figures accumulated show that available storage sites on these streams if properly utilized would increase the possible electrical output by nearly 500,000,000 hp.-hours annually. The Connecticut has particularly large possibilities of storage, the full scheme indicated covering fifty-six storage reservoirs. The situation on the Merrimac is less favorable for future developments, but great gain can be made through more efficient use of water and especially by storing against the heavy wastage of water which now occurs in spring. There are, however, some considerable unutilized powers at fairly high heads, in three cases of 200 feet (60 m.) or more, which make a material addition to the resources of the state. The actual working out of the storage propositions in many cases may be somewhat troublesome and expensive, since there are many rights to be acquired by reason of present minor utilizations of power; and probably the full advantage could not be gained without a generalized and comprehensive scheme for utilization backed by plenary powers. As the total possible saving of coal annually runs toward 300,000 tons, considerable expense would be justified. Local studies of this kind give a vivid idea of the hydraulic waste at present going on and of the economic gains that may ultimately be made. The total figures for New Hampshire quite certainly exceed those here quoted, for there are many comparatively small streams which could at a pinch be utilized as feeders for a general network. Lack of suitable market and of coördination between the various systems of power supply now existing hinders actual development.

Reconstruction Rate Making

IN ANALYZING central-station methods the public service commissions have not thought it to be in the public interest to disturb the rate-making structures of well-managed properties. Their attitude in accepting the methods of rate-making generally in force has a bearing on the conditions of the present and the future which should not be lost sight of. If these powerful bodies were inclined to be antagonistic to the bases of rates in the central-station industry, the problem of meeting the disquieting higher cost level would be much greater than it now appears to be. Approving the main principles of the rate schedules, the commissions and the companies have the responsibility of meeting a situation arising from economic changes world-wide in influence. We have called attention many times to the very creditable record of the central stations in lowering maximum and average rates as business grew, improvements developed in apparatus and operating economies were evolved and applied. It is not asserted that their wise policy in this respect was altruistic in its motive. It was good business for them so to do. Nevertheless, they are entitled fairly to commendation because they followed the path of enlightened progress.

At this time it is right to consider carefully that underlying this policy, which runs through the history of central-station development, was a belief that the course of operations would continue without substantial change of direction. Painting the growth of the industry in rough strokes, we may say that from the early beginnings in lighting there was a long step to the present conspicuous position of the central station as the recognized economic supplier of electric power for the industrial needs of the community; with this, but not yet realized to the large degree possible, is the diversion of the urban railway load to the central-station system, and looking beyond the present is the undoubted incorporation of the local central stations into interconnected systems and the promising outlook for a place in railroad electrification projects. This is a logical and practical program involving steady growth. It certainly has meant greater and greater production totals with a very bright promise and fulfillment of low generating costs, of distribution expenses whittled to the smallest possible economical point. So far as this picture relates to operating possibilities, it has undergone no change. It is, in fact, given a stronger intensity by the lessons of the war. But the internal question in it which is now obtruded to the front by the changes of the times is that of cost. Higher cost spells no change in the strength of the case of the central station from a purely operating point of view. It does spell financial change, or, to be conservative, we shall say the necessity of watching carefully to safeguard the properties against the danger of a demoralizing financial change.

Since the broad principles of rate making may be regarded as approved by the commissions, the problem which arises is that of the apportionment among different classes of consumers of the aggregate cost plus reasonable return which is a just expectation. It is not a simple thing to meet the conflicting views prevailing on the question of cost of residential service for the small proportion of total consumption usually included in that class of business. Here the element of public policy enters, and we think that the commissions will favor the practice of such accounting as will justify on the whole a lower rather than a higher level of rates for such consumers and, if necessary, offsetting levies of higher charges to power users. Residential rates should be made and kept as low as possible. All other classes of rates should be made to yield under a fairly exact calculation the necessary sum of cost plus reasonable return. There are some features of the present railroad situation which point a moral that we cannot overlook. The dangers which overwhelmed the railroads should be avoided in order that the great central-station industry may be kept in a better position than the carriers were in to meet the public demand for service. For years the commissions, notably the Interstate Commerce Commission, refused to heed the pleas of the carriers for higher rates. Yet when government operation was authorized as a war measure epochal rate advances were made, and the extra burden of transportation cost which is placed upon the public is appalling. Railroad chaos is undesirable. Analysis and just treatment of the central-station industry will sustain it in a position for continued progress that will substantially benefit the public.

Makeshift installations of individual motor drive must inevitably give place to coördinated mechanical and electrical machine-tool designs, still none too common in industry. Here is a field of technical advance which has never been intensively cultivated over more than a fraction of its total area.

A Gigantic Waterwheel Generator

IN OUR issue of May 31 we noted the interesting fact that the Niagara Falls Power Company had allotted to each of three different manufacturers one of the 32,500-kva. generating units required for its work and distribution. We are now glad to be able to give an account of one of the waterwheel generators under this contract, especially interesting because the same company provides both wheel and generator. In this case divers striking features have been introduced into the mechanical design. The feature of the present combination is that the generator is carried directly above the turbine and mechanical unity is given to the two by a cast-iron-ribbed barrel which unites the generator stator with the cast-steel speed ring of the turbine, and thence to the wheel foundations, while this shell at the same time forms the line-up for the pit and supports the operating cylinders that work the gates. It is thus possible to use a short shaft kept in accurate alignment. In a generator of this immense size it is necessary to provide brakes for bringing the machine to rest and to hold it in case of leakage. These brakes are operated by air pressure and engage the lower surface of the field spider rim. Obviously, if anything happens to the thrust bearings, the brakes must take the whole weight of the rotating parts, and the brake support is carried by the aforesaid connecting shell.

The generator, like the others under construction, is for 12,000 volts, three-phase, 25 cycles, and is to be operated with neutral grounded through a resistor. The stresses in the rotor are designed with great conservatism, so that even if the wheel should run away the stresses in the rotor will not exceed one-third the elastic limit.

The total weight of the rotor is about 120 tons, and

it is suspended from a thrust bearing carried by a spider at the top of the unit and capable of carrying 210 tons. This bearing runs in an oil bath through which oil supplied from a central system flows at the rate of 35 gallons (132 liters) a minute, and the friction loss at the 150 r.p.m. of the unit is estimated at only 26 hp. Below the thrust bearing is the upper guide bearing, the lower one being just above the waterwheel runner. For cooling the generator an air supply of about 80,000 cubic feet (2260 cu.m.) a minute is furnished, taken in at the top and from the pit, carried over the windings and through the stator core, and then discharged through the outer casing into ducts whence it is forced out of the station by auxiliary fans. To aid its circulation the rotor carries steel-plate centrifugal fans at both top and bottom. There have been no radical departures in the design of this huge machine, but it has been planned for the highest possible combined efficiency, and the mechanical features have been worked out with unusual thoroughness.

Interconnection should be pushed farther afield this fall in many localities which have not realized its benefits. The fuel savings due to even a short tie line reduce the railroad burden in winter, and the coördinated operation of adjacent systems utilizes labor advantageously, besides reducing the capital outlay necessary for meeting business expansion with more service.

Charging Batteries from Tungar Rectifiers

FOR the charging of small storage batteries from alternating-current mains, where the efficiency of the operation does not need to be over, say, 40 per cent, the Tungar rectifier, a vacuum-tube device, has distinct advantages. It has been customary to use mercury-arc rectifiers for this purpose, and it is still advisable to do so when the amount of power required exceeds a certain limit. For small-scale operation, however, the Tungar rectifier, operating from 115-volt mains, with an out-transformer, forms a very simple and compact source of storage-cell supply.

F. Keith D'Alton has recently described the theory and applications of the Tungar rectifier in a series of articles in the *Electrical News*, as has been mentioned in our Digest. He points out that, having obtained a given output and efficiency from a single-phase, 115-volt pair of mains, it is possible to duplicate the plant and obtain double the output from single-phase, 230-volt outside wires. Moreover, it is possible to use three such single plants, in combination, on a three-phase system, with increased advantage and smoothness of rectification.

It is indicated in the article that, provided the direct-current impulses follow each other with sufficient rapidity to maintain a unidirectional emf. and current, with ripples, in the direct-current circuit, this rectified current can be used for resistance measurements. In other words, ordinary direct-current voltmeters and ammeters, employed in the output circuit, give results that correspond to Ohm's law. This relation can, however, only be expected to hold when the ripple superposed on the direct current is symmetrical about its own zero line. In such a case the reading of a direct-current instrument will be the same as if the ripple were completely suppressed.

Purdue's High-Voltage Laboratory

IN THE eighteenth century the only known or available form of electricity was high-tension static electricity as obtained from the frictional machine. It was not feasible to transmit or utilize such electricity, if only because it was not known how to insulate it effectively. Nevertheless, a good foundation was laid for the theory and principles of electricity by the study of high-tension phenomena.

The subsequent discovery of the voltaic cell introduced a revolutionary change in the ideas, concepts and beliefs concerning electricity and its behavior. It was thought that a new kind of electricity had been found. Indeed, many electricians claimed that voltaic electricity was totally different from static electricity. Voltaic electricity slowly but steadily began to find useful applications. Each new application raised the voltage of the generating source.

In the last thirty years the voltage of commercial electrical transmission and distribution systems has very rapidly increased, until we now think less of 100,000 volts pressure than we thought of 1000 volts at the beginning of that period.

Looking back at the history of electrical progress, it may be said that it has taken nearly one hundred and fifty years to climb up in the available voltage of voltaic electricity to the level of the preëxisting static electricity. The difference is, however, that the electricians of to-day are engineers, and are able to control the high-tension electricity they generate, whereas the electricians of one hundred and fifty years ago were powerless to control the electricity they produced in very small quantities.

It may be that we have already reached, below 250,000 volts, the practicable limit of high-tension voltage transmission, or it may be that still higher voltages remain to be harnessed and utilized. In either case large amounts of experiment and investigation are needed in order to develop the knowledge and availability of the high-tension field. There is plenty of work to be done in this direction for the needs of industrial practice, future invention and present knowledge.

It is interesting in this connection to read the article of Prof. C. F. Harding, in a recent number, on the enlargement and extension of the high-voltage laboratory conducted in connection with the department of electrical engineering at Purdue University, Lafayette, Ind. In this university high-tension transformers are in course of installation up to 270 kva. and for 600 kv. between high-tension buses.

It is desirable that individual technical colleges should develop and maintain individual specialties of study. Of course, each and every electrical engineering college of any pretensions as to equipment and course of training must have some high-tension apparatus and high-tension experimental work in its courses. It is, however, very undesirable that either all the colleges or most of them should invest in extensive and expensive special high-tension equipment. It is sufficient that such a specialty should be developed and actively maintained at not more than one or two institutions. On the other hand, each institution could advantageously develop some particular specialty of its own, and there are always sure to be more than enough electrical specialties to go around among the active institutions of the world.

Development of Arc Radio Transmitters

Principle of Poulsen Arc Is Used for the Production of Undamped Waves—Provision for Ready Adjustment of Wave Length—Interesting Problems Are Solved in Prevention of Eddy Current and Corona Losses and Insulation Breakdown

BY ADRIEN L. ANDERSON, WORKS MANAGER, AND HAROLD F. ELLIOTT, PRODUCTION MANAGER, FEDERAL TELEGRAPH COMPANY

IN RADIO-TELEGRAPHY theory and experience have taught that undamped oscillations are necessary to insure long-distance daylight transmission and to obtain selectivity. Of the several means for producing undamped oscillations the Poulsen arc method is one of the most widely used, especially in radio stations of moderate and high power.

Arc radio transmitters are based upon Valdemar Poulsen's method of obtaining undamped radio-frequency oscillations by means of an electric arc. The arc

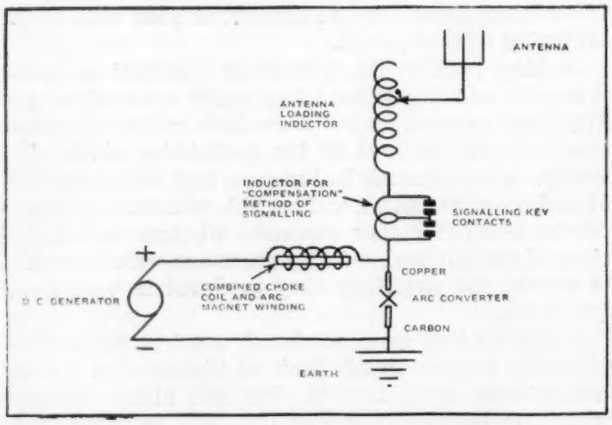


FIG. 1—ARC TRANSMITTER WITH COMPENSATION METHOD OF SIGNALING

is inclosed in a chamber with an atmosphere containing hydrogen, and the electrodes are placed between the poles of a powerful electromagnet, which produces a strong transverse magnetic field tending to blow the arc out. Carbon or graphite is used for the negative electrode, while the positive is made of copper and water-cooled. The design of the various parts and their coordination for convenient operation and adjustment are presented herewith.

An arc radio transmitter consists of the following main units: (1) A source of direct current of suitable voltage; (2) an arc converter; (3) an antenna loading inductor; (4) an antenna and ground system; (5) a signaling device; (6) auxiliary and control apparatus.

The essential features of such a transmitter and the circuits employed are outlined in Fig. 1. The arc converts the energy supplied by the direct-current generator into radio-frequency energy with undamped current in the antenna circuit. The choke coil prevents the flow of radio-frequency current from the arc back into the power machinery and serves to sustain and steady the arc itself. The frequency of the undamped current in the antenna circuit depends upon the inductance and capacitance of this circuit. The frequency, and therefore the wave length, may be altered by changing the value of either the inductance or the capacitance or both. Since the capacitance is furnished by the antenna, and is therefore fixed, the inductance of the circuit is varied in making changes of wave length. This is accomplished by changing the connections to the antenna-loading inductor by means of a high-voltage switchboard known as the wave changer.

In the field of radio communication arc converters are used to convert direct current into alternating current of very high frequency, for example, 60,000 cycles. All parts of an arc converter are stationary except the carbon electrode, which is rotated very slowly, in order that it may burn evenly, and which is made so that it may be screwed in and out in order to strike and adjust the arc. In operation the length of the arc flame is adjusted to secure maximum antenna current, and this is the only adjustment or attention required. After the arc has been started and adjusted only occasional slight adjustments are needed. The carbon does not burn away as in an ordinary arc, but, on the other hand, usually very slowly builds up, depending on the chemical composition of the gas in the chamber. This very convenient feature makes it possible to operate an arc converter for hours at a time with only a few slight adjustments of the carbon.

Approximately one-third to one-half of the direct-current power supplied to the arc is converted into radio-frequency energy in the antenna circuit. The theoretical efficiency of the arc flame is 50 per cent. The actual efficiency of the arc converter will vary within the range mentioned above, depending upon the size of the arc and the conditions under which it is operated.

CAPACITIES UP TO 1000 KW. ARE AVAILABLE

The Federal Telegraph Company of California has developed the Poulsen arc into an efficient and reliable electrical unit by the application of engineering methods. There are at present in use in this country and abroad arc transmitters of the following sizes manufactured by this company: 5, 20, 30, 60, 100, 200, 350, 500 and 1000 kw. Arc radio transmitters are rated according to the normal amount of direct-current power supplied to the converter. In this article only those of moderate and semi-high power will be described, namely, from 5 kw. to 100 kw.

In the field of ship sets the 5-kw. equipment is especially adapted to the needs of destroyers, small naval vessels and merchant ships. Sets rated at 20 kw. are designed especially for battle ships and scouting cruisers, and 30-kw. transmitters are used on very large vessels. The latter probably have the greatest sending radius of all ship sets in existence. The range of wave lengths used in this class of work varies from 1000 to 5000 meters.

In general, each land set offers a special problem, particularly those of high power. The apparatus for these is designed in each case to meet the antenna and service

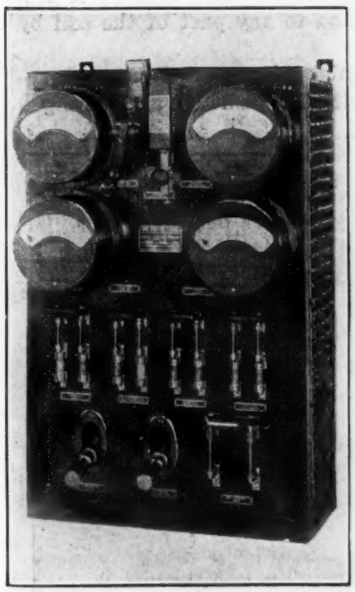
conditions found at the stations. Sets rated at 5 kw. and 20 kw. are employed in low-power land installations and as auxiliaries in large ones. There are a large number of 30-kw. sets in use for communicating over relatively long distances under difficult conditions. For installations of moderately high power 60-kw. and 100-kw. units are used. Equipment of this rating is installed in certain transatlantic stations and others having similar service. For overland and transoceanic work wave lengths from 2000 m. to 15,000 m. are employed.

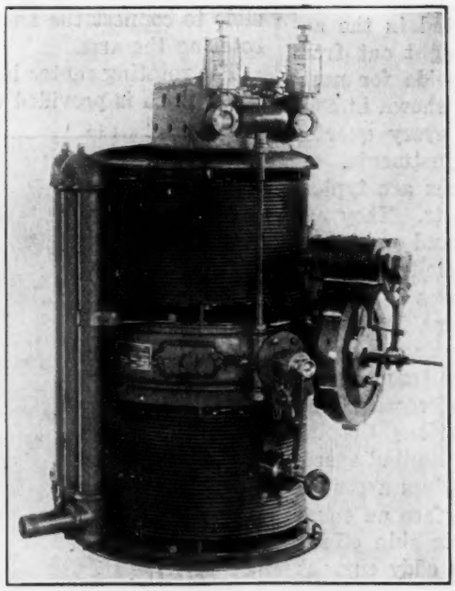
SUPPLYING DIRECT-CURRENT ENERGY

The usual source of direct current is a motor-driven direct-current generator. This may be either compound-wound or shunt-wound, but the general practice is to furnish shunt-wound, separately excited machines. The power output of a transmitter is controlled by regulating the excitation of the generator. The full-load generator voltage required for transmitters of from 5 kw. to 100 kw. varies from 500 volts to 600 volts.

In addition to the protection afforded the direct-current generator by the choke coil, it is customary to connect a 600-volt railway-type electrolytic lightning arrester between the positive terminal and earth. To insure reliability the usual practice is to furnish the power machinery for land stations in duplicate. Duplication is not necessary in the case of the arc equipment, where a few spares are found sufficient.

Fig. 2 shows a control panel for a 5-kw. ship transmitter. This panel, which may be installed in front of the operator, completely controls the arc converter and auxiliaries. On it are mounted the motor and generator voltmeters and ammeters, main-line and arc-starting resistor switches, generator circuit breaker and segregating switches for auxiliary circuits.





FIGS. 2 AND 3—CONTROL SWITCHBOARD AND ARC CONVERTER FOR 5-KW. SET

In the case of the larger land stations an arc-control benchboard is placed near the control wheel of the arc converter. From this the entire station may be operated by electrical remote control. The main power switchboards are placed as found convenient.

Like most electrical machinery, both mathematical relations and practical considerations determine the proper size and shape of the component parts of an arc converter. Modern Poulsen arcs are mathematically designed to meet certain specifications as to standard antenna constants, range of wave length and antenna currents. The magnetic field strength is a function of the power, frequency and kind of hydrocarbon used. The direct-current voltage required varies with the antenna current and the resistance of the oscillatory circuit. The magnetic gap length is dependent upon the direct-current voltage. To obtain a magnetic circuit of high efficiency for a given flux density it is necessary to proportion properly the size and shape of the magnetic pole tip. There are also economic considerations of weight and cost of copper versus that of steel. A presentation of the mathematical relations and formulas required to determine these factors is beyond the scope of this article.

Arc converters may be divided into two classes, according to the type of magnetic circuit used in their construction, viz., open or closed type. A closed magnetic circuit is used when very strong magnetic fields are necessary. To this class belong the high-power arcs. Fig. 4 illustrates a 200-kw. converter which is typical of the closed magnetic circuit construction. Open magnetic circuits are used in arcs of 100 kw. or less. Fig. 3 shows a 5-kw. unit. All of the arcs rated at 100 kw. or less are alike in that they consist of a vertical magnetic circuit with two field coils, one below and one above the arc chamber. The cast-iron base and counterpoise form a part of the magnetic circuit. The choke coils are built as a part of this series winding and help to energize the magnetic circuit. The field coils for the 5-kw. and 20-kw. arcs are wound with cotton-covered magnet wire in layers, with a suitable number of vertical air ducts. The 30-kw., 60-kw. and 100-kw. field windings consist of a number of pancake coils wound with copper strip with micanite insulation between turns. The pancake coils are separated from one another with bakelite spacers. These coils are provided with both vertical and horizontal air ducts. This gives a rugged construction capable of withstanding very heavy overloads.

The water-cooled bronze chamber is provided with a door to permit inspection of the electrodes and cleaning. Hydrocarbon is admitted through a hole in the upper pole, and the flow is controlled by magnetic valves mounted on the arc counterpoise or on the control switchboard (Fig. 3). Alcohol is the hydrocarbon generally used with the smaller arcs. Kerosene is used where considerable power is required on short wave lengths. It will increase the antenna current when the magnet field is weak but produces soot in the chamber, which makes an occasional cleaning necessary. Illuminating gas is used when available.

The carbon is held in a removable collet-type holder. This is so constructed that it may be moved axially for adjustment of the arc length and for bringing the electrodes together to start the arc. A metal tube with a renewable water-cooled copper tip is used for the posi-

tive electrode. This is insulated from the chamber by an ebony asbestos or bakelite disk. The latter is replaceable in case it becomes damaged. In ordinary service both the copper tip and the insulating disk will last several months without renewal.

As mentioned in a previous paragraph, the length of the emitted wave may be varied by altering the number of turns of loading inductor connected in the antenna circuit. Taps are, therefore, brought out from convenient points in the winding to provide for making changes in wave length. In the coils shown in Fig. 5 the bottom layer is made with taps every quarter turn in order to provide for very close adjustments.

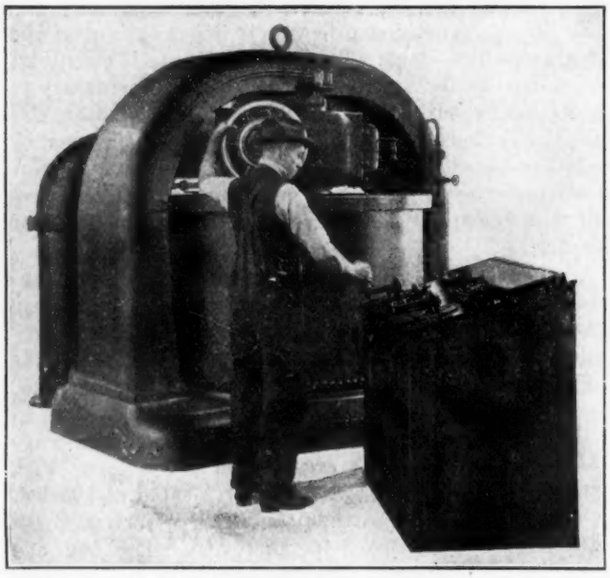


FIG. 4—200-KW. ARC CONVERTER WITH CONTROL BENCHBOARD

The inductors shown in the photographs are typical examples for small and moderate-sized sets. They are air-core coils of radio-frequency cable wound on frames of insulating material. The cable is specially designed for each size and type of coil. In all cases it is composed of many strands of fine enameled wire, the size of the wire and the number of strands depending upon the amount of current the cable is to carry, the frequency at which it is to operate and the degree of compactness required of the coil. For ship installations the inductors must be very compact because of limited space. The cable is constructed so that all the wires are near the outer surface and all come to the surface an equal number of times. This is done to reduce skin effect. The use of fine enameled wire minimizes eddy current losses in the conductors.

In the case of the coils shown in the photographs bakelite is used for the insulating frames. The cable of large coils for land stations is supported by porcelain columns. In any form of construction it is necessary to design the coil to withstand high voltages at radio frequencies. The frames are constructed as far as possible without the use of metal parts, as even copper causes losses due to eddy currents if placed too close to the winding of such a coil. Iron, under similar conditions, will become red hot and must be avoided not only in the construction of the coil but in the immediate surroundings.

A wave changer is a high-voltage switchboard which provides a convenient means of connecting the desired number of turns of loading inductor in the antenna circuit. Wave changers are usually built with provisions for the use of five different wave lengths. When an arc radio transmitter is installed connections are made between the antenna loading inductor and the wave changer for these five wave lengths, and in subsequent operation the operator may use any one of them by turning a lever to the proper position.

Porcelain post insulators are used to support the high-voltage parts of the switching apparatus. In case voltages above 20,000 or 30,000 are anticipated special shields are employed to eliminate corona losses. These shields are metal caps made with relatively large radii of curvature and prevent the formation of corona. This same precaution must be taken in all parts of the antenna circuit which operate at high voltage, for corona is very prolific at radio frequencies, causing enormous losses of energy.

The 30-kw. wave changer, shown in Fig. 5, is a typical example and serves to show the method of construction employed. The porcelain insulators are mounted on steel panels. The unit may be supported by floor or wall braces or it may be mounted in the wall of the loading coil room.

There are five stationary insulators mounted in a semicircle around a central rotating insulator. The rotating insulator carries a switch arm which may be moved into contact with any one of the five stationary switch blades. The arm is connected to the antenna, and the blades are connected by cables to any five taps of the antenna-loading inductor, thereby making it possible to connect the antenna to any part of the coil by rotating the arm.

The rotating center insulator is mounted upon a turntable which is provided with ball bearings and arranged so that it may be turned either by hand or by a small electric motor in case remote control is used. The wave changer in the photographs is provided with such a motor and is arranged for electrical remote control from the operator's table. A drum controller is used, and by turning this to any one of the five positions the

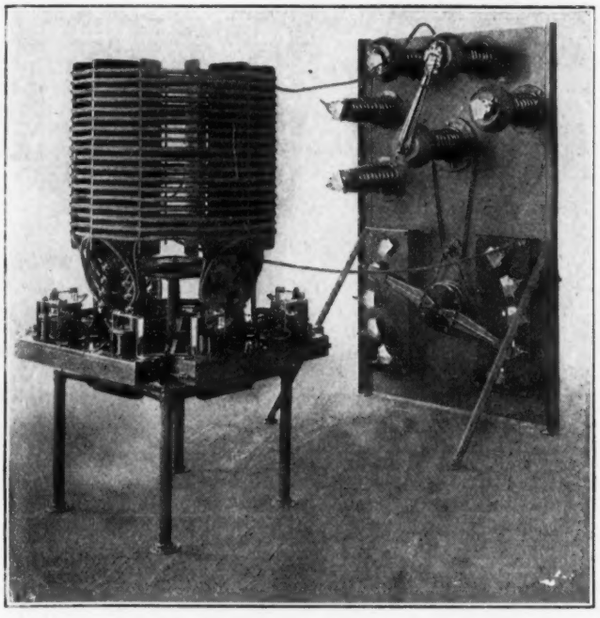


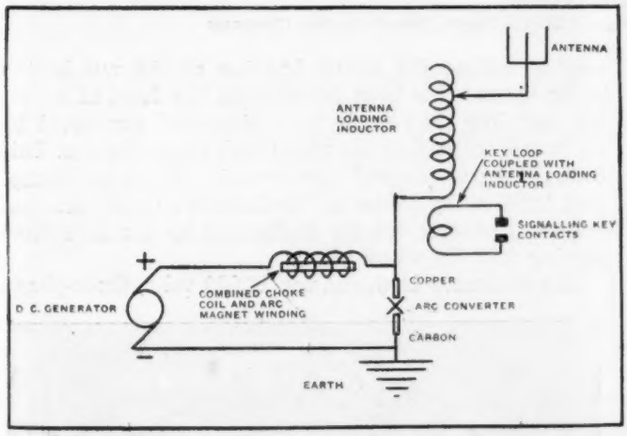
FIG. 5—30-KW. ANTENNA-LOADING INDUCTOR, SIGNALING SYSTEM AND WAVE CHANGER

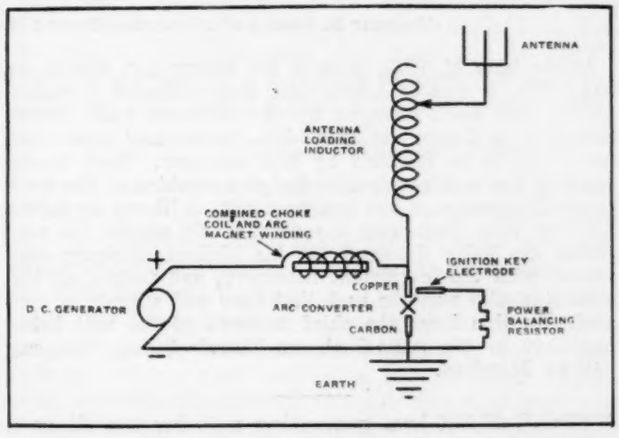
operator may use any of the wave lengths for which the set is adjusted.

In the photographs two smaller switches will be noticed on the lower panel. These are turned by a chain whenever the main wave changer is operated and serve to make two further adjustments which are required with changes in wave length. One of these switches is used for making close adjustments in the amount of inductance in the antenna circuit. By means of it the arc converter may be connected to any one of the quarter-turn taps in the bottom layer of the coil. This switch, therefore, makes it possible to adjust the amount of inductance connected in the antenna circuit to within one-quarter of one turn, which will obviously give very fine adjustments of wave length.

The other small switch is used to tune or adjust the strength of the magnetic field of the arc. An arc converter requires a relatively strong field for short waves and a weaker field when operating on long waves. Arcs are therefore built with taps brought out from convenient points in the series field winding, and when long waves are used a portion of the winding is shorted out by the switch just described.

After the set has once been tuned and adjusted for a given series of wave lengths, the operator can instantly change from one to another by turning his controller handle, and the wave changer makes all the necessary adjustments in the circuits. This is a great advantage in certain classes of service where the ability to change wave length quickly is desirable, in order to avoid interference and to enable the station always to work on the wave which gives the most advantageous transmission conditions.





FIGS. 6 AND 7—ARC TRANSMITTER WITH (6) COUPLED COMPENSATION METHOD AND (7) IGNITION KEY-SIGNALING SYSTEM

Signaling Systems

There are several methods of signaling employed with arc radio transmitters. In Fig. 1 the "compensation" method is shown. This is probably the means most generally known and one which is in wide use on sets of moderate power. Signals are produced by slightly varying the length of the emitted wave. Two waves, differing in length by a few per cent, are radiated, and the receiving station tunes so as to hear only the wave which is transmitting signals. When the key contacts are closed the inductance of the antenna circuit is decreased and the emitted wave is therefore shorter than it is when the key is open. Signals may be sent on either the long or the short wave.

A modification of this method, and one possessing several advantages, is indicated in Fig. 6. It is known as the "coupled compensation" signaling system, so called because the circuit containing the signaling key is coupled to the antenna circuit instead of being connected directly in it. With this arrangement it is possible to increase the load handled by each pair of contacts and also to adjust it to a value which gives practically sparkless operation. When the contacts of the key are closed the key loop becomes the short-circuited secondary of a high-frequency air-core transformer. By reason of transformer action and mutual inductance between the main loading coil and the key loop the resultant inductance of the system is slightly decreased and the emitted wave is therefore shortened. The number of keys and loops required varies from one for a 5-kw. set to twelve for a 100-kw. unit. More are obviously required for stations of higher power, the exact number depending on the power to be handled and the electrical constants of the antenna circuit. In Fig. 5 the keys and loops of this type of signaling system are shown mounted on a frame beneath the loading coil.

Another means of signaling which is suitable for relatively small sets is shown in Fig. 7. This is known as the "ignition key" signaling system. The arc burns only when signals are being emitted and is extinguished between the dots and dashes. Only one wave, therefore, is radiated. When the key electrode is pulled back, as shown in the figure, the arc burns between the carbon and copper electrodes as though no third electrode were present, and current then flows in the antenna circuit. When the key electrode is pushed forward and allowed to make contact with the copper electrode, the arc is extinguished and the power supplied by the direct-current generator is then absorbed in the power-balancing resistor. If the key electrode is again pulled back, the resultant flame caused by its breaking contact with the copper electrode re-ignites the arc and current immediately flows in the antenna circuit. Signaling is therefore accomplished by moving the key electrode in and out and thereby alternately extinguishing and igniting the arc. The power absorbing resistor is adjusted so that the direct-current supplied by the generator remains constant whether the key is "open" or "closed."

Other signaling circuits have been devised for arc radio transmitters, but the three described above are the ones most generally used at the present time.

A high-voltage transfer switch is provided in order that the antenna may be connected to either the transmitter or receiver at will. This switch is similar in construction to the wave changer except that it has only three positions—send, ground and receive. The middle point is provided for grounding the antenna during an electrical storm and when the station is not in use.

The construction and operation of land stations of moderate and high power is not unlike that of substations in power practice. The men at the station have only to start and stop the motor-generators and arc converter when they are requested to do so. The operations required to start an arc set are few and simple. The motor-generator is started by pushing a button. A drum controller is used to operate the various arc control circuits. The first two or three steps of this controller start the cooling water flowing through the arc, turn on the hydrocarbon supply and start the carbon rotating motor. The next step closes a set of contactors on the power switchboard, which connect the arc to the direct-current generator. The attendant then strikes the arc and adjusts it to obtain a maximum reading of the antenna ammeter. A last step or two on the controller close further contactors, which short out the series-starting resistance and bring the arc up to full power. After this no further attention is required except occasional slight adjustments of arc length.

A 32,500-Kva. Waterwheel Generator

One of the Three Units Under Way for Niagara Falls—Weighs 300 Tons—Generator and Wheel Casing Rigidly Connected—Rotor Spider and Field Ring Not Integral—Reactance 20 per Cent—Support of Coil Ends

BY R. B. WILLIAMSON
Engineer in Charge of Alternating-Current Design, Allis-Chalmers Manufacturing Company

In the May 31, 1919, issue of the ELECTRICAL WORLD, on page 1156, it was explained that three different manufacturers have been engaged by the Niagara Falls Power Company to design the 32,500-kva. waterwheel generators which are to be installed by that company. Each manufacturer has been required to design a machine of the same external appearance but has been left at liberty to follow his own ideas regarding the details. Of course, the machines are being designed for the highest efficiency consistent with the investment necessary, and their electrical characteristics must be such that they will operate in parallel. In this issue the chief features of the unit being furnished by the Allis-Chalmers Manufacturing Company will be described.

THE 32,500-kva. generating unit for the Niagara Falls Power Company that has been under construction during the past year by the Allis-Chalmers Manufacturing Company is mounted directly above a 37,500-hp. turbine, the two forming a close-coupled unit with but a relatively short distance between the two machines. Thus the shaft can be made short and stiff and the combined unit has but two guide bearings, one at the top of the generator immediately below the thrust bearing and the other directly above the waterwheel runner. To carry the generator a large cast-iron barrel of heavy-ribbed design is bolted to the cast-steel speed ring of the turbine, thereby transmitting the weight of the generator through the barrel to the speed ring and foundation below the wheel. This shell forms a pit liner and at the same time connects the wheel and generator rigidly together, thus insuring accurate alignment. The connecting barrel also forms a support for the operating cylinders that control the gate opening of the wheel.

With these large vertical units it is necessary to provide brakes for bringing the machine to rest and for holding it in case of leakage through the wheel. In this instance the brakes are operated by air pressure and engage the lower surface of the field spider rim. Since the support for these brakes has to be able to take the whole weight of the rotating element in case it is necessary to relieve the thrust bearing of the weight the brake support has been designed in the form of a conical cast-iron shell made in sections and supported by the barrel connecting the wheel with the generator. This forms a strong compact arrangemnt, and the brake support incidentally forms an air inclosure under the generator to prevent the air discharged by the fans from passing into the wheel pit.

The generator is wound for 12,000 volts, three-phase,

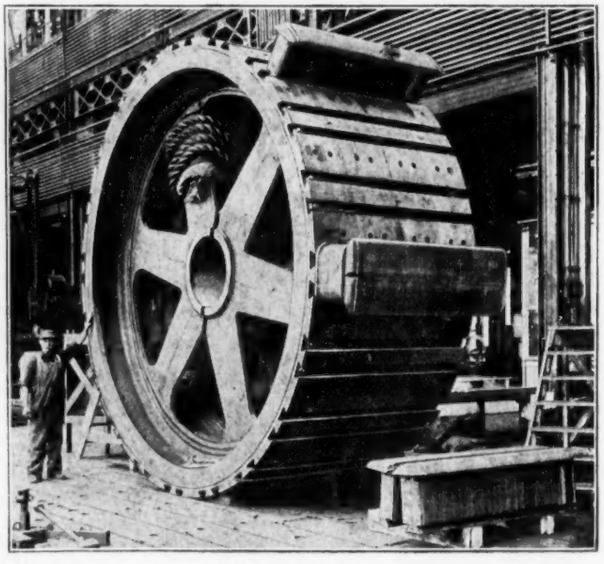


FIG. 1—ROTOR SPIDER FOR 32,500-KVA. GENERATOR WITH A FIELD COIL AND POLE IN PLACE

and will be operated with neutral grounded through a resistor. The frequency is twenty-five cycles at 150 r.p.m., the machine having twenty poles. While this generator is of very large output, the design in general does not differ greatly from that found in other large waterwheel machines. Since the speed of 150 r.p.m. is not so high as to introduce any unusual problems, the de-

sign of the rotor is less difficult than in many machines of much smaller output running at higher speed.

Based on the runaway speed of the waterwheel (approximately 85 per cent overspeed), the stresses in the rotor will not in any case exceed one-third the elastic limit of the material. The rotor spider is made up of two wheels each of which consists of an inner cast-steel spider on which is shrunk a cast-steel field ring

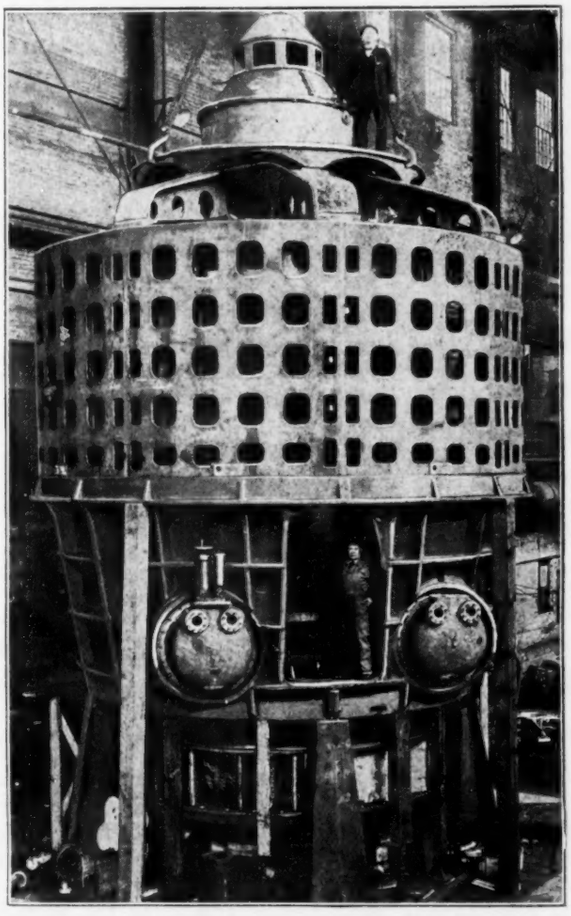


FIG. 2 — COMBINED WATERWHEEL AND GENERATOR RATED AT 32,500 KVA. AND INTENDED FOR NIAGARA FALLS POWER COMPANY

Dovetail slots in the latter afford means for attaching the field poles, two dovetails being provided per pole. By this construction the field ring can be cast without local shrinkage stresses due to spokes, etc., because it is in the form of a plain ring made with uniform section.

The rings were cast with exceptionally large risers, and very universal castings were thus secured. Other advantages in making the rings separate are that they can be machined inside, thus insuring better balance; moreover, any stretch due to centrifugal force does not cause local stresses in the inner spider arms. Each pole weighs approximately 3 tons, but the face of the rotor is so wide that the dovetail stresses are not more difficult to keep within safe limits than on many smaller machines. The total weight of the rotor with its shaft is approximately 265,000 lb. (120,000 kg.), and the flywheel effect of the rotor is 10,500,000 lb.-ft. sq. (440,000 kg.-m. sq.). Including all parts the machine weighs slightly under 300 tons.

For the stator yoke the usual box-frame design made in sections was employed to facilitate transportation and foundry work. The stator core will be stacked and the machine wound in the station. All parts have to be lowered over the cliff at Niagara Falls in order to place them in the power house, and this condition had to be kept in mind in designing the machine. When installed the stator yoke will be surrounded by a sheet-steel casing, which will conduct the hot air discharged through the yoke openings to suitable ducts.

Dovetail projections hold the stator punchings in the yoke, the iron sections varying from 1½ in. (4 cm.) to 2 in. (5 cm.) in thickness. Ventilating ducts are provided in the usual manner. The inside diameter of the stator punchings was fixed largely by consideration of the shipment of the rotor parts and the use of a solid rim for the rotor-field ring. In this case the diameter is 16 ft. 4 in. (5 m.), and the peripheral speed is 7700 ft. (2350 m.) per minute. The outside diameter of the stator yoke is 21 ft. (6.4 m.).

Two-layer winding with fifteen slots per pole, or 300 coils in all, is used for the stator. The winding is arranged for Y connection, each end of each phase being brought out of the machine to permit the insertion of current relays and grounding of the neutral through a resistance. Although the temperature guarantees are those corresponding to class A insulation (A. I. E. E.), the coils are provided with mica insulation (Class B) both for the individual turns and also for the outer slot insulation, thus giving a large margin of safety.

PROTECTING COILS AGAINST SHORT CIRCUITS

While this unit has a very large output, the problem of supporting the ends of the stator coils against damage from short circuits is not so difficult as in many machines of smaller output operating at high speed, as, for example, turbo-generators. The reactance of a relatively low-speed machine of this kind is high, in the present case about 20 per cent, and this limits the momentary short-circuit current to a safe value. Again with a twenty-pole machine the coils do not project such a great distance beyond the stator core as in higher-

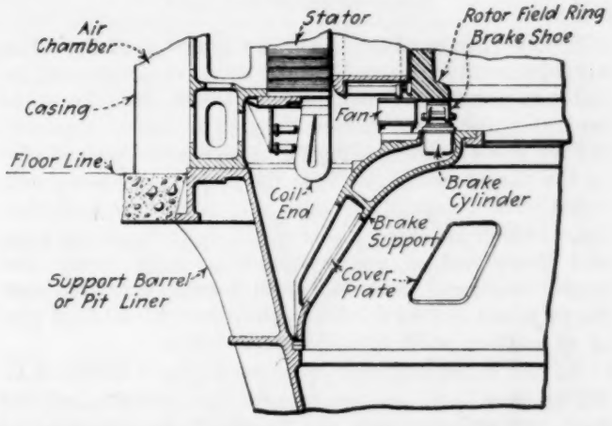


FIG. 3—CROSS-SECTION THROUGH LOWER HALF OF GENERATOR AND PIT LINES, SHOWING SUPPORT FOR BRAKES

speed machines. In the present design the coils are securely blocked just where they project beyond the core to protect them against any side motion and consequent danger of breaking the insulation at the ends of the slot. They are also lashed to the insulated supports as indicated in the accompanying sketch. These supports are made in sections and are bolted to projecting brack-

ets cast on the stator end heads. The design is such that all metal parts near the coils are heavily insulated, and the supports themselves are arranged so that they cannot form conducting paths for stray currents induced by leakage fields from the winding. The diagonal parts of the coil ends are separated by blocking corded in place, and, in general, the method of coil support follows the practice that has been found successful in turbo-generators.

In designing the three generators for this development different manufacturers coöperated with a view to having the external appearance and general dimensions correspond as nearly as practicable, so that the finished installation would present a uniform appearance. The upper bridge that carries the thrust bearing has eight radial arms and is of cast steel made in two parts. Directly below the thrust bearing is the upper guide bearing, which is 22 in. (56 cm.) in diameter and 36 in. (91 cm.) in length. A Kingsbury thrust bearing, 49 in. (124 cm.) in outside diameter and capable of carrying a suspended load of 465,000 lb. (210,000 kg.), is provided. This has been ample to carry the weight of the rotor, waterwheel parts and downward hydraulic thrust on the turbine runner. Notwithstanding the heavy load supported by this bearing, the estimated friction loss is only 26 hp. at 150 r.p.m. The bearing runs in an oil bath through which oil, supplied from a central system, is circulated at the rate of 35 gal. (132 l.) per minute. Where the shaft passes through the thrust bearing it is 18 in. (46 cm.) in diameter; at the center of the rotor spider the diameter is 26 in. (66 cm.). The shaft projects a short distance below the bottom of the machine and is provided with a 45-in. (114-cm.) diameter forged-on flange for bolting to a corresponding flange in the waterwheel shaft.

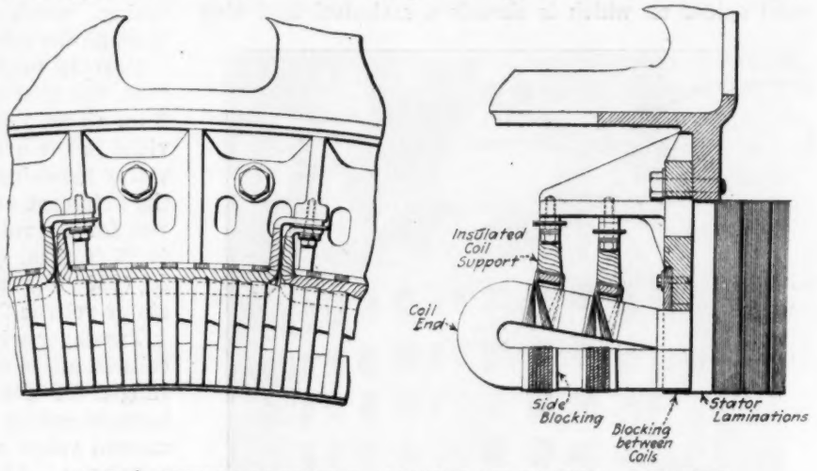


FIG. 4—METHOD OF BRACING, BLOCKING AND LASHING COIL ENDS

ARRANGEMENTS FOR OIL

Special care has been taken in the design of the oiling arrangements in order to make these as simple and reliable as possible. Oil supplied to the machine from the central system first passes through a duplex strainer; it then flows through separate branches of the feed pipe to the thrust and guide bearings, each pipe being provided with a regulating valve and sight-flow indicator. An oil meter is placed in the thrust-bearing supply pipe, and thermometers are provided for both thrust and guide bearings. Seamless steel tubing expanded into flange joints is used for the drain pipe. All oil-feed pipe is of copper with brazed flange joints.

As this generator requires approximately 80,000 cu.ft. (2240 cu.m.) of air per minute for carrying off the heat, the arrangements for handling the air required careful consideration. Air is taken in at the top and also from the pit underneath and, after passing over the windings and through the stator core, is discharged into the casing surrounding the stator yoke. It then flows through ducts and is forced out of the station by means of auxiliary fans. The rotor is provided with steel-plate centrifugal fans on both top and bottom to force the air through the machine. A strong blowing action is also exerted by the poles and the ventilating openings betwen the poles in the rotor rim.

From the foregoing it will be seen that while this generator is of unusually large size the design in general involves no radical departures from the usual lines for machines of this type. The aim has been to make a conservative design throughout and at the same time obtain a highly efficient hydroelectric unit. Both of these objects are materially aided by the large output combined with moderate speed.

STEAM CONVEYOR PROVES ECONOMICAL IN ASH HANDLING

Cost of Handling Ash in an Installation of 1250-Hp. Capacity Is Reduced from $16.46 per Day to $4.08 by Steam Conveyor

Comparative figures are given below showing relative costs of disposal of ashes by hand and steam for a boiler plant containing one 500-hp. and five 150-hp. boilers operating continuously. A steam ash conveyor was installed, replacing the use of men and horses. The ash-handling costs before and after the installation of the steam ash conveyor are as follows:

Former cost:		
Two ash wheelers	$10.88	
One teamster	4.08	
One horse and feed	1.50	
		$16.46
Cost after installation of conveyor:		
One laborer (nine hours)		4.08
Saving, twenty-four hour day		$12.38

The laborer acts, between fire cleanings, as assistant fireman and boiler-room helper. The ashes are left on the boiler-room floor in front of the boiler until the cleaning is completed and are then put into the conveyor, which handles the complete cleaning in about seven minutes. The grates are cleaned every two hours. It will be seen that the actual time the laborer spends at work handling ashes is relatively small. If the time spent on other work were charged against that operation, the savings would be decidedly greater.

These figures were furnished by Guy S. Hamilton of the American Steam Conveyor Corporation, whose equipment was used in the installation under consideration at the Big Mine of the Canada West Coal Company, Ltd., Taber, Alberta.

Standardized Industrial Lighting Systems—II

Engineering Plans for Conduit, Wiring, Panel and Fixture Arrangements Which Provide Economical Layouts in Standard Buildings 100 Ft. and 150 Ft. Wide Respectively

BY H. L. CORNELISON
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ON PAGE 69 of the July 12 issue of the ELECTRICAL WORLD an article was published giving data and plans on standard industrial lighting layouts for a flat-roofed building with two bays each 30 ft. (9 m.) wide and a monitor-roofed building 90 ft. (27 m.) wide. Methods of mounting fixtures, data on candlepowers, wattages, conduit sizes, wire gages, etc., were given in detail for each layout. A discussion of the engineers' methods of working out the layouts was also included. The buildings treated in that article were called "standard buildings Nos. 1 and 2," according to the Austin Company's nomenclature. On this and the two succeeding pages are given similar drawings and data for standard buildings Nos. III and X, which are monitor-roofed buildings 150 ft. (46 m.) and 100 ft. (30 m.) wide respectively and which employ different fixture arrangements. All of the discussion of engineering methods given in the former article also applies to the data and drawings which are presented in this installment.

Details of Lamp and Wiring Layouts in Standard Building No. III

BUILDING IIIa—(Two Outlets per Bay)
2 ft.-candles; two 150-watt lamps.
4 ft.-candles; two 300-watt lamps.
Four outlets per circut.
For ten-circuit cabinets
Main feed for sixteen bays, 60-amp., three-pole switch, three No. 4 wires, 1¼-in. conduit.
Main feed for twenty-four bays, 100-amp., three-pole switch, three No. 2 wires, 1½-in. conduit.
For twenty-circuit cabinets
Main feed for sixteen bays, 200-amp., three-pole switch, three 1/0 wires, 2-in. conduit.
Main feed for twenty-four bays, 200-amp., three-pole switch, three 3/0 wires, 2-in. conduit.
Note—If 300-watt outlets are used place two outlets per circuit and use dotted layout.

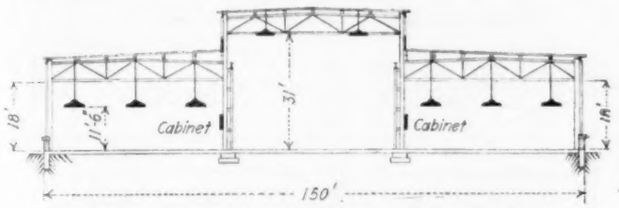


FIG. 6—CROSS-SECTION OF STANDARD BUILDING NO. III (SEE FIGS 8, 9 AND 10)

BUILDING IIIb—(Three Outlets per Bay)
4 ft.-candles; three 200-watt lamps.
6 ft.-candles; three 400-watt lamps.
Three outlets per circuit.
For sixteen-circuit cabinet
Main feed for twelve bays, 100-amp., three-pole switch, three No. 2 wires, 1½-in. conduit.
Main feed for eighteen bays, 200-amp., three-pole switch, three 3/0 wires, 2-in. conduit.
For twenty-two-circuit cabinet
Main feed for twelve bays, 200-amp., three-pole switch, three 2/0 wires, 2-in. conduit.
Main feed for eighteen bays, 200-amp., three-pole switch, three 4/0 wires, 2½-in. conduit.
Note—If 400-watt lamps are used place two outlets per circuit as indicated by dotted lines.

BUILDING IIIc—(Four Outlets per Bay)
2 ft.-candles; four 75-watt lamps.
4 ft.-candles; four 150-watt lamps.
6 ft.-candles; four 300-watt lamps.
Four outlets per circuit.
For twenty-circuit cabinet
Main feed for sixteen bays, 200-amp., three-pole switch, three 1/0 wires, 2-in. conduit.
Main feed for twenty-four bays, 200-amp., three-pole switch, three 3/0 wires, 2-in. conduit.
For thirty-four-circuit cabinet
Main feed for sixteen bays, 200-amp., three-pole switch, three 4/0 wires, 2½-in. conduit.
Main feed for twenty-four bays, 400-amp., three-pole switch, three 400,000-circ. mil, 3-in. conduits.
Note—If 300-watt lamps are used place two outlets per circuit as indicated by dotted lines.

BUILDING IIId—(Six Outlets per Bay)
4 ft.-candles; six 100-watt lamps.
6 ft.-candles; six 200-watt lamps.
8 ft.-candles; six 300-watt lamps.
Six outlets per circuit.

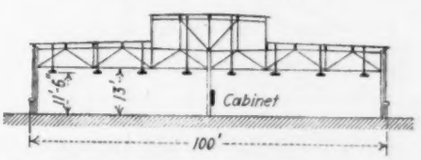


FIG. 7—CROSS-SECTION OF STANDARD BUILDING NO. X (SEE FIGS. 8, 9 AND 10)

For sixteen-circuit cabinets
Main feed for twelve bays, 100-amp., three-pole switch, three No. 2 wires, 1½-in. conduit.
Main feed for eighteen bays, 200-amp., three-pole switch, three 3/0 wires, 2-in. conduit.
For thirty-circuit cabinets
Main feed for twelve bays, 200-amp., three-pole switch, three 3/0 wires, 2-in. conduit.
Main feed for eighteen bays, 400-amp., three-pole switch, three 300,000-circ. mil, 3-in. conduit.
Note—With 200 or 300-watt outlets use three outlets per circuit as indicated by dotted lines.

BUILDING IIIe—(Eight Outlets per Bay)
6 ft.-candles; eight 150-watt lamps.
8 ft.-candles; eight 200-watt lamps.
Six outlets per circuit.
Main feed for twelve bays, 200-amp., three-pole switch, three 1/0 wires, 2-in. conduit.
Main feed for eighteen bays, 200-amp., three-pole switch, three 3/0 wires, 2-in. conduit.
Note—Use No. 12 Duplex on all circuits.

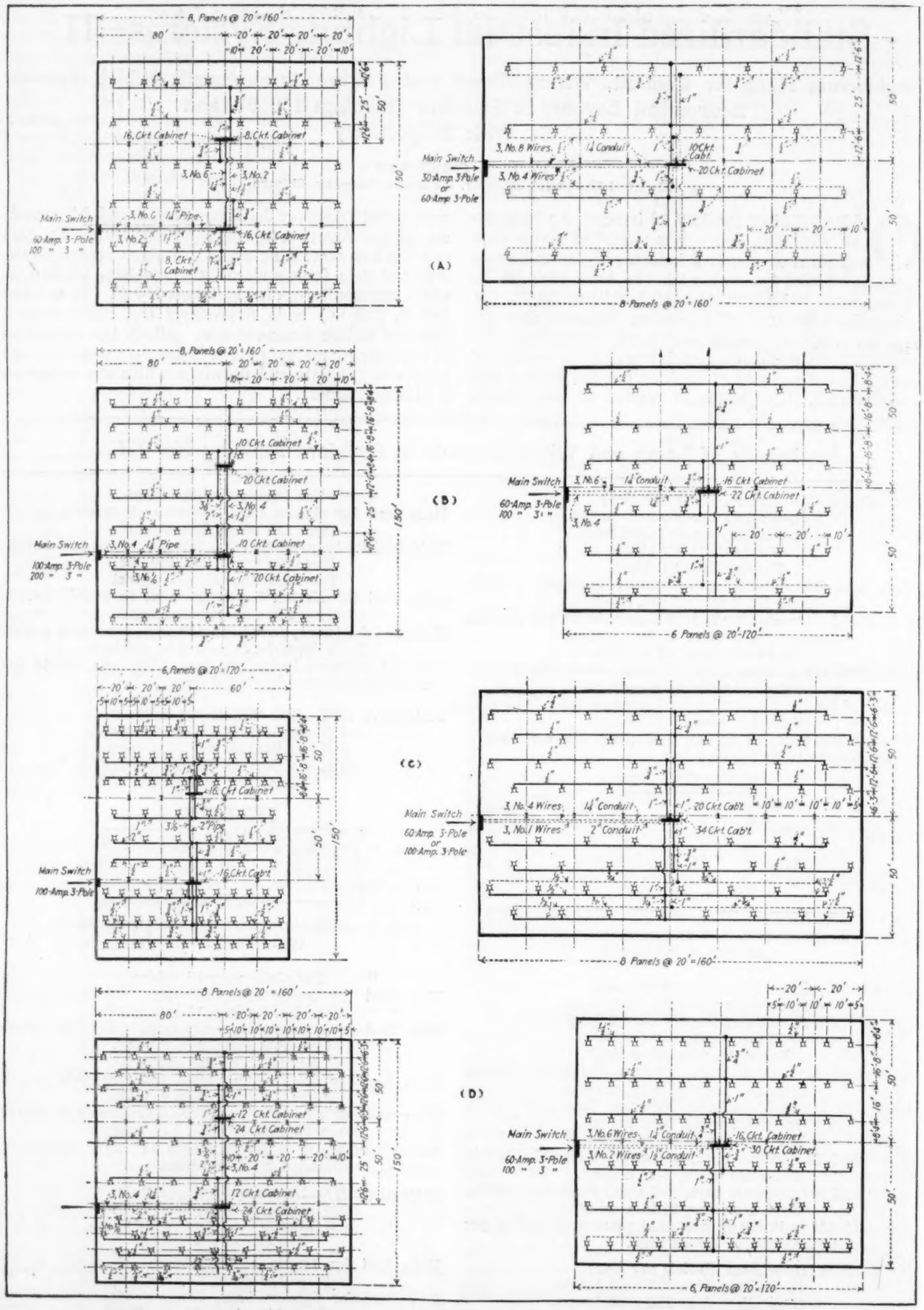


FIG. 8—CIRCUIT AND OUTLET ARRANGEMENT IN 100-FT. AND 150-FT. MONITOR-ROOFED BUILDINGS
These are standard buildings Nos. III and X. Close spacing is here not required.

Details of Lamps and Wiring Layouts in Standard Building No. X

BUILDING Xa—(Four Outlets per Circuit)

Two outlets per bay (low bays)
2 ft.-candles; two 150-watt lamps.
4 ft.-candles; two 300-watt lamps.
Two outlets per bay (high bays)
2 ft.-candles; two 150-watt lamps.
4 ft.-candles; two 300-watt lamps.

Note—If 300-watt outlets are used run conduit as per dotted sketch, placing two outlets per circuit.

For eight-circuit cabinets

Feed for sixteen bays, 100-amp., three-pole switch, three 3/0 wires, 2-in. conduit.

Feed for twenty-four bays, 200-amp., three-pole switch, three 2/0 wires, 2-in. conduit.

For sixteen-circuit cabinets

Feed for sixteen bays, 200-amp., three-pole switch, three 4/0 wires, 2½-in. conduit.

Feed for twenty-four bays, 400-amp., three-pole switch, three 350,000-circ. mil, 3-in. conduits.

Three outlets per bay (high bays)
4 ft.-candles; three 200-watt lamps.
6 ft.-candles; three 300-watt lamps.
8 ft.-candles; three 400-watt lamps.

Note—For 300 and 400-watt outlets run No. 12 Duplex wire.

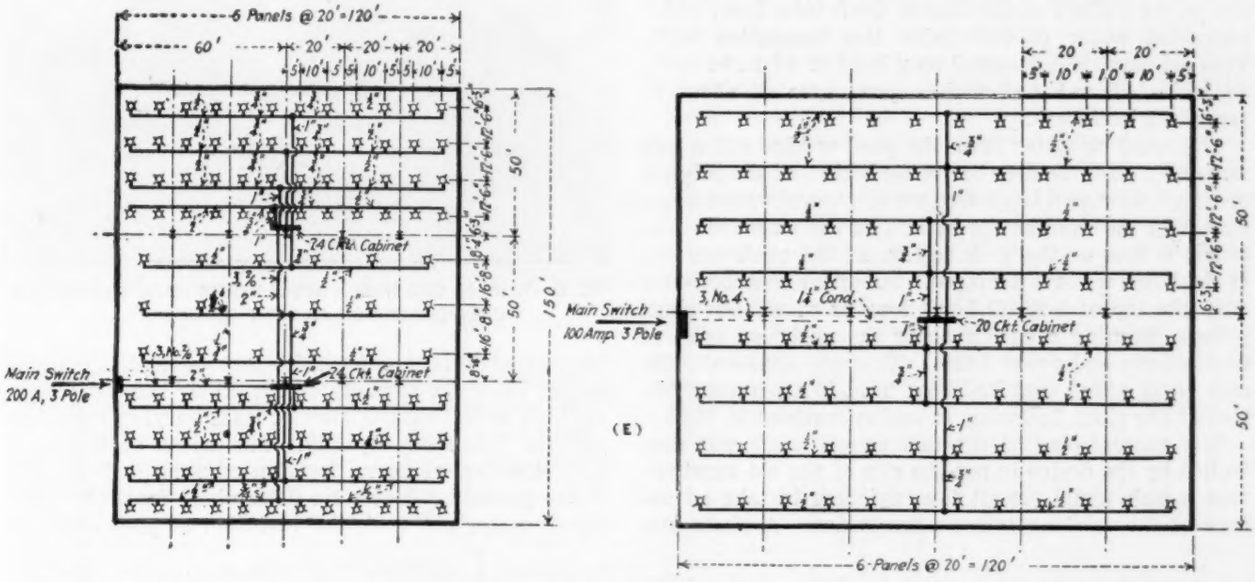
For sixteen-circuit cabinet

Feed for twelve bays, 200-amp., three-pole switch, three 4/0 wires, 2½-in. conduit.

Feed for eighteen bays, 400-amp., three-pole switch, three 350,000-circ. mil, 3-in. conduit.

BUILDING Xd—(Four Outlets per Circuit)

Four outlets per bay (low bays)
2 ft.-candles; four 75-watt lamps.
4 ft.-candles; four 150-watt lamps.
6 ft.-candles; four 300-watt lamps.
Two outlets per bay (high bays)
2 ft.-candles; two 150-watt lamps.
4 ft.-candles; two 300-watt lamps.



FIGS. 9 AND 10—CIRCUIT AND OUTLET ARRANGEMENT FOR STANDARD BUILDINGS NOS. III AND X FOR EXTRA CLOSE SPACING

BUILDING Xb—(Four Outlets per Circuit)

Three outlets per bay (low bays)
2 ft.-candles; three 100-watt lamps.
4 ft.-candles; three 200-watt lamps.
6 ft.-candles; three 400-watt lamps.
Two outlets per bay (high bays)
2 ft.-candles; two 150-watt lamps.
4 ft.-candles; two 300-watt lamps.
6 ft.-candles; two 400-watt lamps.

Note—If 300 and 400-watt outlets are used run conduit as per dotted lines, placing two outlets per circuit.

For ten-circuit cabinets

Feed for sixteen bays, 200-amp., three-pole switch, three 1/0 wires, 2-in. conduit.

Feed for twenty-four bays, 200-amp., three-pole switch, three 3/0 wires, 2-in. conduit.

For twenty-circuit cabinets

Feed for sixteen bays, 400-amp., three-pole switch, three 300,000-circ. mil, 3-in. conduit.

Feed for twenty-four bays, 400-amp., three-pole switch, three 450,000-circ. mil, 3-in. conduit.

BUILDING Xc—(Three Outlets per Circuit)

Six outlets per bay (low bays)
4 ft.-candles; six 100-watt lamps.
6 ft.-candles; six 200-watt lamps.
8 ft.-candles; six 300-watt lamps.
6 ft.-candles; two 400-watt lamps.

Note—If 300 and 400-watt outlets are used run conduit as per dotted lines, placing two outlets per circuit.

For twelve-circuit cabinets

Feed for sixteen bays, 200-amp., three-pole switch, three 2/0 wires, 2-in. conduit.

Feed for twenty-four bays, 400-amp., three-pole switch, three 4/0 wires, 2½-in. conduit.

For twenty-four-circuit cabinets

Feed for sixteen bays, 400-amp., three-pole switch, three 350,000-circ. mil, 3-in. conduit

Feed for twenty-four bays, 400-amp., three-pole switch, three 500,000-circ. mil, 3-in. conduit

BUILDING Xe—(Three Outlets per Circuit)

Eight outlets per bay (low bays)
6 ft.-candles; eight 150-watt lamps.
8 ft.-candles; eight 200-watt lamps.
Three outlets per bay (high bays)
8 ft.-candles; three 400-watt lamps.

Note—If 300 and 400-watt outlets are used run No. 12 Duplex wire.

For twenty-four-circuit cabinets

Feed for twelve bays, 400-amp., three-pole switch, three 350,000-circ. mil, 3-in. conduit

Feed for eighteen bays, 400-amp., three-pole switch, three 500,000-circ. mil, 3-in. conduit

Rebuilding of a Small Hydroelectric Station

Twice as Much Output Obtained from Same Amount of Stream Flow When Hydroelectric Station Is Rebuilt After Washout—Cost per Horsepower Is About $80

IN DECEMBER, 1916, without previous warning, the two-unit, 430-kva. hydroelectric station of the city of Lowell, Mich., on the Flat River, began to settle and within a very short period completely collapsed. The power-house structure, the generators and the waterwheels became virtual junk. So complete was the destruction that one of the wheels and a generator were the only equipment salvaged that could be sold as second-hand machinery. This accident, which interrupted the electricity supply for the cities of Lowell and Belding until breakdown service could be secured from the Consumers' Power Company, was apparently due to the failure of the timber draft-tube floor, which permitted water to undermine the foundation walls. This old plant had operated on a head of 13 ft. to 15 ft. (4 m. to 4.6 m.) and with a pond area of about 50 acres (20 hectares).

The escaping water from the pond washed out a hole some 8 ft. (2.4 m.) deep below the bottom of the original draft-pit floor, and large sections of concrete were found buried in the sand at the bottom of the washout. The concrete floor at the rack section at the upstream end of the flume was not damaged. This floor was connected with the top of 5-ft. (1.5-m.) lengths of wooden sheet pilings, forming a cut-off along the upstream edge of the spillway and power house. This was apparently the only sheet piling that had been used in the reconstruction of the plant following an earlier washout in 1906.

The general plan of the new power house was controlled by the desire to use the site of the old construction, which would permit the engineers to take advantage of the existing tailrace excavation. A study was first made of the stream-flow and load conditions to determine the probable economical development, which was found to be for a plant capacity of about 475 cu.ft. (13.3 cu.m.) per second. This quantity of water provided a turbine capacity of 0.93 cu.ft. per second per square mile (0.068 cu.m. per sq.km.) of drainage area. The normal head on the wheels was taken at 15 ft. (46 m.), although 16 ft. (4.9 m.) may be obtained in the summer months by carrying water to the limit of the present flowage rights. The minimum head with full pond at flood periods will be about 14 ft. (4.3 m).

In order to carry the probable load on the plant to the best advantage, one turbine was selected at approximately twice the capacity of the other, thereby obtaining high operating efficiency at loads varying from one-sixth to full plant capacity. The width of the wheel pits, elevation of floors, location of units and the plan of the generator floor were determined from the quantity of water per unit, the variation of pond and tail-water surfaces, the room required for operation and other similar considerations. Particular care was taken in the design to prevent damage to the power house which might arise from the end of the spillway being connected with the substructure.

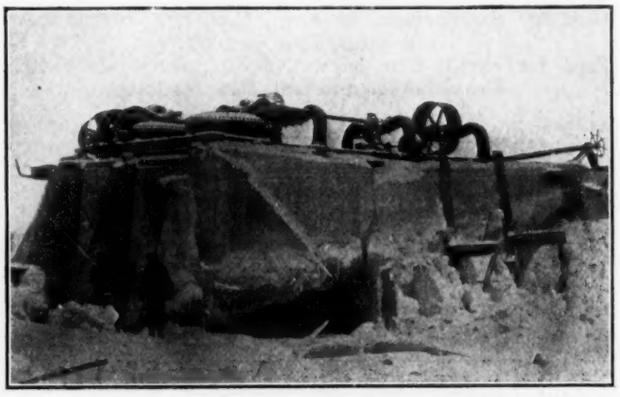
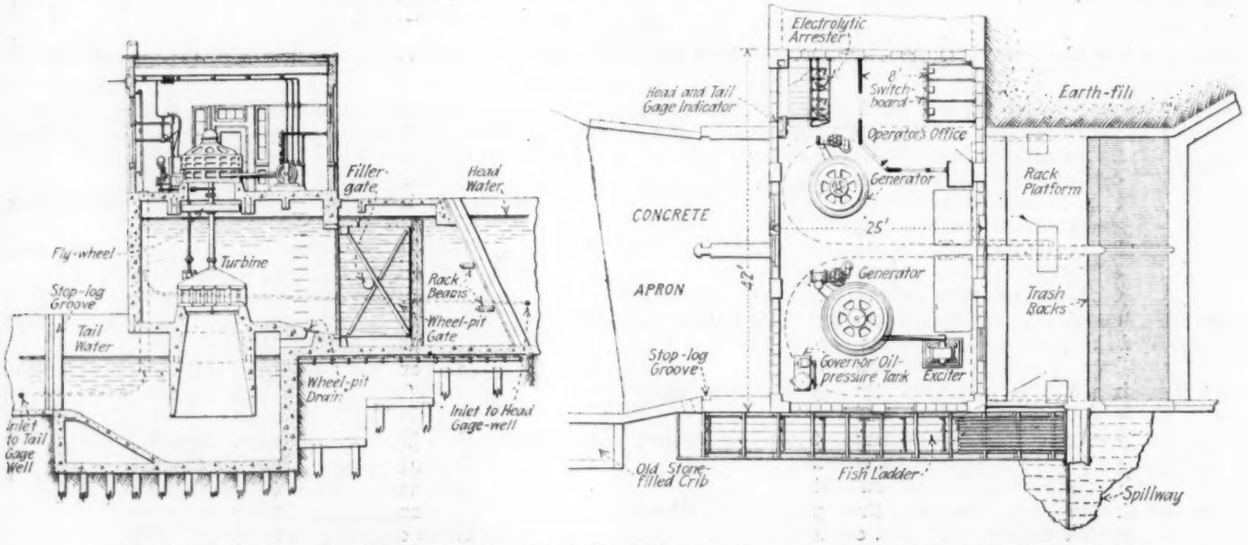


FIG. 3—VIEW OF THE WRECK AFTER DEBRIS FROM THE OLD TILE SUPERSTRUCTURE HAD BEEN CLEARED AWAY



FIGS. 1 AND 2—SECTION THROUGH PLANT SHOWING UNIQUE DRAFT-TUBE DESIGN AND ARRANGEMENT OF APPARATUS IN NEW PLANT

In order to limit the possibility of another washout the new structure was placed on a reinforced-concrete mat 33 ft. (10.1 m.) wide and 77.5 ft. (23.6 m.) long, having an average thickness of 18 in. (46 cm.). Round-oak piling in 30-ft. (9-m.) lengths on 3-ft. (0.9-m.) centers with tops embedded in the concrete mat were driven under all bearing walls. Steel interlocking sheet piling in 20-ft. (6-m.) lengths, with its top embedded in the concrete mat, was driven along the side adjacent to the present spillway, and tongue-and-groove wooden sheet piling of nominal 6-in. (15-cm.) thickness and the same length was driven along the up-stream edge to insure a cut-off of the water from the pond. Considerable attention was paid to obtaining an adequate factor of safety in the draft-pit floor, which was placed substantially at the elevation of the bottom of the washout occasioned by the failure of the old structure. The location of the draft-pit floor at this elevation resulted in its being some 8 ft. below the normal tailrace bottom, and at least 6 ft. (1.8 m.) below the grade of an economical tailrace excavation. Advantage was taken of this rather deep draft pit by using a cone-shaped draft tube discharging straight downward and permitting the water from the turbine to rise in the draft pit around the cone tube to the tailrace level. This is a rather unusual draft-tube design, and its operation has been watched with considerable interest. The draft tubes have proved to be very satisfactory, giving power output from the turbines very close to the Holyoke test of the type model. A section through this unusual draft-tube design is shown on one of the accompanying drawings.

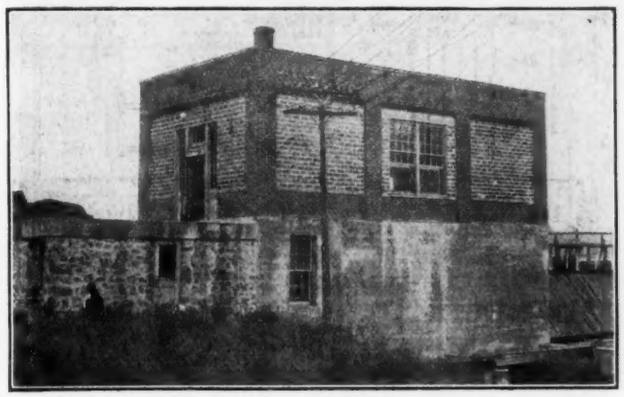


FIG. 4—NEW STATION BUILT ON SITE OF OLD ONE

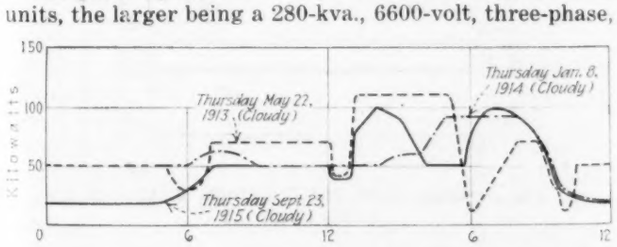
The plant equipment consists of two main generating units, the larger being a 280-kva., 6600-volt, three-phase, 60-cycle vertical-type Electric Machinery Company generator of 150 r.p.m., direct connected to a 400-hp.—at 15-ft. (4.5-m.) head—type "Z" Leffel vertical-shaft turbine. The smaller unit is at 165-kva., 6600-volt, three-phase, 60-cycle vertical-type Electric Machinery Company generator of 200 r.p.m., directly connected to a 200-hp.—at 15-ft. head—type "Z" vertical-shaft Leffel turbine. Energy for exciting the larger machine is taken from a 16-kw., 125-volt compound-interpole, belt-driven exciter driven through a quarter-turn belt from a pulley on the vertical shaft. The exciter for the smaller unit is rated at 10 kw., 125 volts, compound-wound, and is mounted on top of the vertical shaft of the unit above the thrust-bearing housing. Flywheels are provided on each unit to give a total flywheel effect of 72,000 lb.-ft. square (3000 kg.-m. square) and 18,000 lb.-ft. square (750 kg.m. square.) for the larger and smaller units respectively.

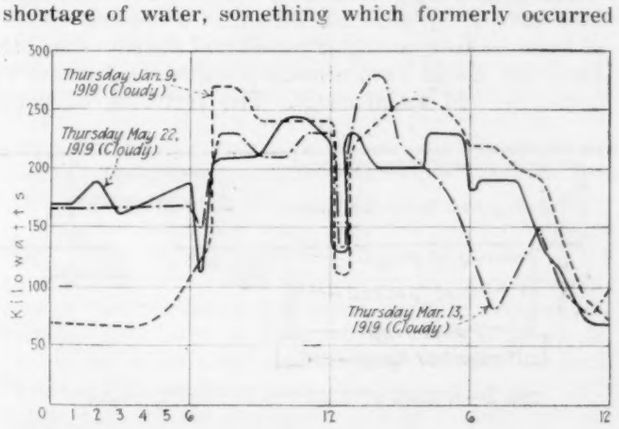
Without changing the generator potential of 6600 volts, energy is conducted through a Westinghouse switchboard to transmission lines which go to the city of Lowell and to the city of Belding. The line to Lowell is 9 miles (14.5 km.) long, and consists of three No. 6 bare copper wires on 30-ft. poles. It terminates in a 300-kva. bank of Scott-connected transformers which supply two-phase, 2300-volt energy for distribution in the city. The transmission line for Belding is of similar construction and is about 7 miles (11.3 km.) long. The distribution at Belding is 6600-volt, three-phase.

Some idea of the load in the two cities may be gained from the fact that the load at Lowell is made up of about 600 residence and store customers; a general street and boulevard lighting system, taking 33 kw.; a connected commercial motor load of 388 hp.; the village electric pumping load averaging about 25 hp., and an electric cooking load of forty electric ranges. The load at the village of Belding consists of a small number of lighting customers and a few large motor customers, so that the day load of Belding equals that of Lowell. The characteristics of the load at the two cities may be judged from the accompanying load curves.

Operating Results and Costs

The new plant is showing marked increase in efficiency over the old. This is due both to the improvement of the efficiency of the units and to the method of operation. As a result the plant has carried for the past two years more than twice the load that the old plant normally handled and has not yet experienced a shortage of water, something which formerly occurred each year in the late summer and winter months. The results at this plant may be taken, according to the engineers, as an instance of what reconstruction in small hydroelectric plants can accomplish when the rebuilding is not hampered by such limitations as are usu-





FIGS. 5 AND 6—LOAD CURVES FROM PLANT BEFORE AND AFTER RECONSTRUCTION

ally imposed by the necessity of considering limitations in the existing power station.

The costs of reconstruction distributed to the principal items are as follows:

Tests, pits and borings	$142
Clearing site	2,836
Cofferdams	97
Taking care of water	2,244
Excavation	1,695
Earth fill	535
Piling	4,553
Concrete	7,382
Reinforcing steel	2,381
Structural steel	314
Wheelpit, gates, gages, etc.	1,248
Superstructure	1,643
Equipment	18,565
Engineering and supervision	3,732
Total	$47,364

Since the total installed horsepower amounts to 600 hp. and since the total cost is $47,364, the cost per horsepower is about $80.

The hydroelectric plant and electric distribution system of Lowell are under the supervision of Frank J. McMahon, who reports to the city trustees. The design and reconstruction of the new plant were carried out under the direction of Holland, Ackerman & Holland, consulting engineers, Ann Arbor, Mich. The Hauser-Owen-Ames Company of Grand Rapids did the construction work on a cost-plus-a-fixed-sum basis.

CONTROL GALLERY FOR INDUSTRIAL INSTALLATIONS

Two-Level Gallery, One for Panels and Other for Resistors—Spaced Channels for Panel Mounting—Resistor Stacking Frame

BY S. L. GUTHORN
Electrical Engineer, Perin & Marshall

THE growing adaptation of remote-controlled contactor panels for auxiliary motors, particularly in steel mills, compels careful consideration of the housing of such panels. Of the two methods, vault and gallery, the latter only will be discussed.

The gallery may consist of a steel-framed concrete floor carried by adjacent columns. It should consist of tiers for both contactor panels and resistor stacking. Each tier should have necessary walkways for ease of inspection and maintenance. The fastening of panel

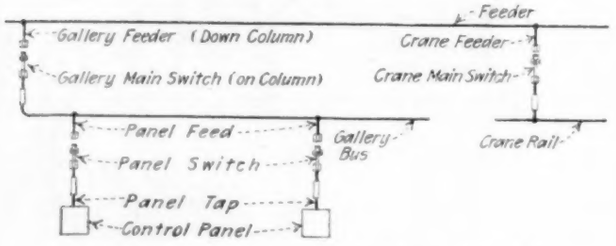


FIG. 1—WIRING SCHEME FOR TWO-LEVEL GALLERY

supports and resistors should be accomplished by a method which will be adjustable and eliminate field drilling. The number of galleries is determined by each gallery's capacity, future requirements and extension, and by the layout of the motors in the building.

A typical arrangement of a gallery fulfilling these conditions and especially adaptable for plate-mill auxiliaries is shown in Fig. 2. Two elevations are provided the lower for panels and cables and the upper for resistor stacking.

The floor flanges which carry the 1¼-in. (32-mm.) pipe panelboard frame are bolted to the two floor channels, placed back to back and spaced with ⅝-in. (16-mm.) spacers. The upper end is held against the channel of

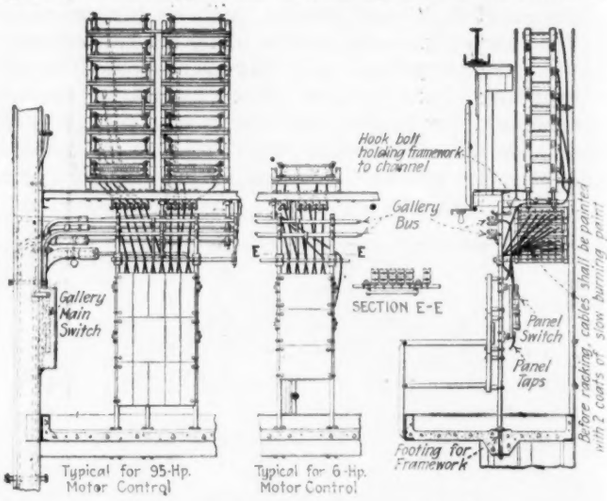

Hook bolt holding framework to channel
Gallery Bus
Gallery Main Switch
SECTION E-E
Panel Switch
Panel Taps
Before racking, cables shall be painted with 2 coats of slow burning paint
Footing for Framework
Typical for 95-Hp. Motor Control
Typical for 6-Hp. Motor Control

FIG. 2—TWO-LEVEL CONTROL GALLERY

The features are the method of supporting the panels, the cable hanger and the stacking frames for resistors.

the upper-tier walkway by means of two hook bolts and nuts and a yoke. Thus, any width, location and ultimate relocation of panels is permitted without drilling. The 1¼-in. pipe uprights also afford a means of carrying the gallery buses and insulator rack, section *EE*.

The outgoing cables, consisting of two armatures, two to four fields and the control cables, are carried in a rack, consisting of insulators bolted to angles. A given

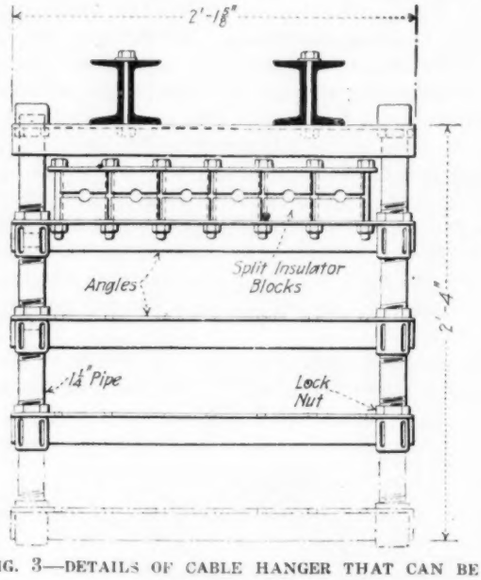


FIG. 3—DETAILS OF CABLE HANGER THAT CAN BE ADDED TO EASILY

row is suspended from a previous one by means of a 1¼-in. (32-mm.) coupling and nipple and held by a faced lock nut, as shown in Fig. 3. Thus as a panel is added its outgoing cable rack is added to the existing ones, without interruption of service, in a very easy and convenient manner.

The rack assembly is suspended from two sets of

4-in. (10-m.) channels, placed back to back and separated ⅝ in. (16 mm.), affording the established flexibility of location, bolting and relocation without drilling.

The second tier or resistor gallery provides for the ready replacement and maintenance of resistors. The resistors are stacked in a number of individual stacking frames (Fig. 4) sufficient to suit the requirements. Each frame has a capacity of one resistor. It carries a resistor independent of that which may be above or below it, making it unnecessary to disturb those above when replacing. By means of fiber insulating feet fastened to the frame by cotter pins resistors are insulated against grounds and a mere lift and pull serves to remove them. They are not bolted in place. All resistor taps are made at the rear of the stack; thus the removal of a frame is not interfered with by wiring to a resistor higher in the group. Resistor taps are

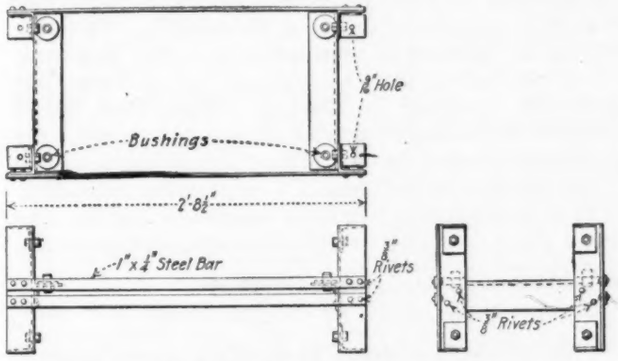


FIG. 4—STACKING FRAME FOR RESISTORS

made with asbestos station cable. The stacks are carried as a unit on four channels spaced ⅝ in. between faces, which permits the same adjustment of location and ease of fastening characteristic of the remainder of the system. The flanges of inner channels carry a 1⅛-in. (3-mm.) iron sheet to catch such parts as may become fused.

A gallery main switch and separate panel switches complete the installation.

REHABILITATION OF THE MUSTERED-OUT SOLDIER

Opportunities Are Needed for Men Who Have Come Back from the War with the Desire to Do Larger Things than Formerly

BY MAJOR BIGELOW, U. S. A.
Director Re-employment Bureau of New York City for Soldiers, Sailors and Marines

A great many young men who were drawn into the army or navy had graduated from public school or high school just a few years ago and, like millions of others, drifted into some blind alley where they never could advance and where they simply ground away the hours from Monday to Saturday, week in and week out. They were drawn into the army; they got abroad; they even saw Paris—the great Paris; they saw the trenches, and they worked and they suffered. They have come back with more vision and a bigger outlook than they ever had before. They are not satisfied now to go back into the old blind alley that leads nowhere and pays the same price year after year.

But they don't know what to do. They don't know what they are fitted for besides the thing they have always done. We have got to rehabilitate these men. I don't mean the wounded men; I mean the men who come back with more vision and desire to do better things than they did before. To that end we have established at this bureau a vocational department where men who understand a bit of psychology and are skilled in the knowledge of trades talk with a man and advise him what he can take up, what he is fitted for, and what is open to him. These men are trying to help the ex-service man realize his larger vision, the increased sense of individual power and the better sense of proportion that he has brought back with him after facing the elemental facts of life. The employer can help us and in doing so will in a measure repay the debt he owes to those who fought for him. He can make room for these men and can give them a fighting chance to make good and to learn a trade and to earn a decent living wage while they learn it.

It is true I have heard a good many complaints about service men. Some say they don't want to work. Some say that they want too much money. Some say this and some say that, but you'll find a reason for it always. Take this example: We sent a number of boys from this bureau as apprentices to a well-known manufacturer. They were to work at $15 a week while they learned, with high hopes to become manufacturers themselves after they had learned the game. They were put to work moving cases around the storeroom, and as the days passed into weeks and they asked the foreman what was the big idea they were simply told there was no future in that line anyway and they had better quit. They did. Now, the head of the factory may have had a fine idea that he would like some apprentices, but the foreman did not have the same idea.

Another instance occurred where a man was sent as an apprentice in a jewelry factory. His coworkers did not want any apprentices because it is easy to keep the price of labor up if you keep the supply down. They kidded him, they rattled him, they joshed him, they made fun of him, until his daily life became a burden, and he quit. Now the employer may say, "I took on an ex-service man, but he didn't want to work." But the employer did not know the innermost workings of his own factory.

We have taken these things up with various unions, and they have expressed a desire to help us train these men. They are mostly beyond the ordinary age of apprentices, but the old system of apprenticing a man at sixteen years of age has largely passed away, and now with the intensive training and highly specialized methods a man can learn his trade in much shorter time than heretofore.

What we want are more opportunities for men to learn trades to get them out of the blind alley. We have already sent 1544 unskilled men to apprenticeships and we have induced 910 so-called clerks to change their vocation and learn a trade. This work must go on, and to do it we need opportunities for men to learn things. The employer must not content himself with taking back his old employees. He must make new opportunities and send them in to us. I speak of the trades, but there are opportunities in other lines. Take a man on and teach him your business, and I know you will find the fighting blood will make good. All kinds went into the army and all kinds are coming out, but by and large the men coming out are just a little better than they were when they went in.

Shall Institute Practices Be Amended?

Members of the A. I. E. E. Display Growing Interest in the Development Committee's Recommendations—Communications from Elihu Thomson and Others Deal with the Question from All Points of View

INTEREST in the recommendations of the development committee of the American Institute of Electrical Engineers in its report to the board of directors is becoming more and more definite as the details of the proposed changes in Institute activities are generally known and understood. In an accompanying letter Prof. Elihu Thomson adds comments to those already published in the ELECTRICAL WORLD, particularly those of Dr. Charles P. Steinmetz (issue of Aug. 2, pages 243 to 246) and of Dr. Louis Bell (issue of Aug. 16, pages 355 and 356), to which he refers. Professor Thomson expresses himself as in favor of decentralization and as opposed to popularization of the publications and to the advertising scheme suggested; L. R. Lee lays emphasis on the importance of the practical side of engineering; Philip F. Barton agrees with the spirit of the proposed changes, and E. N. Lake advocates a radical change applying to all the national technical societies.

Letters from twenty-one other members of the Institute have appeared in the Aug. 2, 9, 16 and 23 issues.

PROFESSOR THOMSON COMMENTS ON PAPERS AND "PROCEEDINGS"

Popularization of Institute Papers Not Necessary—Review of Art Favored for Transactions—Advertising Plan Disapproved

To the Editor of the ELECTRICAL WORLD:

SIR: While I have not had time to study in detail the proposed changes in activities of the A. I. E. E., I am naturally interested, as one of its oldest members and as a past-president, in any movement which may tend to increase the usefulness of the Institute or which may allow it to serve the needs of electrical engineers and those associated with them more completely than has been the case in the past. It is natural that in the growth of the art of electrical engineering conditions should change, and it may well be that an organization which fitted most perfectly the conditions of the earlier days has in a measure become less fitted to the special needs of the present. In fact, this, one may say, was bound to be the case. It therefore becomes very important that any changes which are proposed shall be in the right direction.

DECENTRALIZATION PLAN

I cannot say that I have had time or opportunity to make a detailed study of the particular changes which it would seem to me it would be best to make. I have read the communication of Dr. Louis Bell and find that in all essential particulars I am in agreement with him. I am of the opinion that the plan of decentralization properly carried out would be of very great value. The details of this, however, I am not able to pass upon.

PAPERS AND PUBLICATIONS

As to papers and publications, I cannot feel that there is any need for popularization. I do think some of the papers could be made more attractive by boiling them down as Dr. Bell suggests. The activities of life are such that one wishes to reach the "meat" of any subject at once, and the cultivation of the faculty of brevity in presenting engineering matters is something very much to be encouraged. With Dr. Bell I feel that I can fully indorse Dr. Steinmetz's idea of having reviews of the art published in the *Transactions*. Doing so would render the *Transactions* far more valuable. Of course, the work would have to be undertaken by those who could give time to it and do it successfully. It would require the exercise of excellent engineering judgment.

I do not believe that the Institute papers themselves should be published in abstract. While they should be made as concise as possible, there is no reason for mutilating them. On the manner of issuance of the *Transactions* I do not think I have thought sufficiently to be able to advise. Dr. Bell's suggestions in this line are, I think, certainly worthy of consideration by the members of the Institute.

ADVERTISING IN "PROCEEDINGS"

I am decidedly opposed to printing advertisements with the *Proceedings*. The productions of what Dr. Bell characterizes as a staff of "publicity bounders" cannot improve the *Proceedings*. A good deal of modern advertising is a sort of "jazz" advertising—not a mere clean-cut, truthful statement of fact. There is a great deal of what is called in slang "guff," and it seems almost as if nowadays the advertising expert was chosen largely for his stock of this material. I fear that the Institute would not be entirely able to escape from these machinations.

If I may be permitted to make a suggestion, it would be that we follow the lead of one French journal which I receive. The scientific and technical part of the journal is printed separately from its advertisements, the advertisements being found in a separate pamphlet which can be preserved or destroyed as the case may be, and I would make the suggestion that a good many of our trade journals would be much improved if the same method was adopted. ELIHU THOMSON.

West Lynn, Mass.

THE PROPER SCOPE OF INSTITUTE ACTIVITIES

Attention to Practical Side of Engineering Viewed as a Means of Increasing Usefulness of A. I. E. E. Work

To the Editor of the ELECTRICAL WORLD:

SIR: The writer has noted from time to time the discussion in current numbers of the ELECTRICAL WORLD, and I agree in substance with the report of the development committee. It is a fact that the members as a whole are not getting a great deal out of the *Proceedings*. There is no question about the value of the *Transactions*. Possibly their value could be increased by print-

ing them more promptly, and possibly by printing Volume I as soon as the information is at hand, and completing the year at a later date.

I do not believe the encouragement of papers of a practical nature would in any way cheapen the Institute. The practical side of engineering is most important and is a fertile field for discussion. After all, the practical side of all things interests the majority of people more than the scientific side. This is not depreciating the value of the scientific side in any way, and I would not be in favor of doing anything to discourage or to limit the present excellent papers along purely scientific lines. However, if by some means the scope of the Institute could be increased so that it may embrace the practical side of engineering, I believe the usefulness of the Institute would be greatly increased. I think that the honor and dignity of the Institute will take care of itself automatically. L. R. LEE.

Columbus, Ohio.

SPIRIT OF INSTITUTE CHANGES IS FAVORED

Raising Standards of A. I. E. E. Publications and Avoiding Tendency Toward Commercialism to Be Considered in Working Out Plans

To the Editor of the ELECTRICAL WORLD:

SIR: Referring to your invitation to comment on the report of the development committee of the American Institute of Electrical Engineers, I may say, without having given the report close study, that its recommendations commend themselves to my judgment.

When the publication committee comes to deal with the suggestions relative to Institute publications offered in the report I trust the committee in recommending desirable improvemens may raise rather than lower the standard of Institute publications and that it may avoid any tendency toward commercialism. In my judgment the page dimensions of the *Proceedings* should not be materially changed for any light reason, and expansion of the advertising policy should be avoided sedulously.

Niagara Falls, N. Y. PHILIP P. BARTON.

SUGGESTED CONSOLIDATION OF NATIONAL SOCIETIES

Centralization of General Management of Technical Bodies and Creation of Divisions for Each Engineering Branch

To the Editor of the ELECTRICAL WORLD:

SIR: Personally, I have for some years felt that there are too many national technical societies. Hence the suggested program is as follows:

1. Consolidate all of the national technical societies.
2. Centralize the general management near the geographical center or near the center of combined membership.
3. Form divisions for each engineering branch—civil, electrical, mechanical, etc.
4. Promote the local section plan to decentralize and localize the technical activities.
5. Make all publications 8½ in. by 11 in., each paper bound separately, so that each individual member can group the papers to suit his requirements in binders or in standard vertical letter files. EDW. N. LAKE.

Chicago, Ill.

SWISS RAILWAYS EXTEND ELECTRIFICATION OF LINES

Shortage of Coal Has Led to Development of Water Power and Wider Application of Electricity to Railroad Transportation

The introduction of electric traction on the lines of the Swiss Federal Railways has in latter years, on account of the acute shortage of coal occasioned by the war, received the foremost attention of the authorities and has emerged as a very practical economic question.

The principal lines of the Swiss railway system are government-owned. The electrification of these lines is simplified by the vast store of unused water power the country possesses. According to an official survey, the water power of Switzerland is capable of producing 2,137,000 hp. If old plants were replaced by new ones, it is estimated that the total water-power reserves could be raised to as much as 8,000,000 hp. Approximately 1,000,000 hp. is being developed hydroelectrically at present in Switzerland.

The Swiss Confederation owns some 1800 miles of the railway system of the country. Of the 1416 miles owned by private companies, 622 miles are already electrical, but only an insignificant percentage of the government railroads has so far been operated by electricity.

The first important federal standard-gage road to be chosen for electrification was the Gothard railway. The electrification of the 68-mile section from Erstfeld to Bellinzona was approved in 1913, and it is expected that the road will be open this fall. This section, with 28 per cent of its length consisting of tunnels and a grade of 2.5 to 2.7 per cent for 25 miles, was chosen for experiment because of its enormous traffic with Italy, which caused a large consumption of coal with resulting smoke in the tunnels.

The sections from Bellinzona to Chiasso and from Erstfeld to Lucerne are expected to follow in 1921, and the consulting experts have found that the big power stations at Amsteg and Riton, the former yielding 26,000 hp. and the latter 32,000 hp., will also suffice for these lines, even if the traffic should increase 60 or 70 per cent. Another series of plants yielding 70,000 hp. is planned for eastern and central Switzerland.

The cost of electrification of the Erstfeld-Bellinzona line is estimated at $8,000,000. The cost of electrifying the entire federal railway system is estimated roughly at $200,000,000.

In 1918 the electrification of the following railways using steam traction was decided upon, and work on them commenced at once: The section of the federal railroad from Sion to Brigue and from Berne to Thun; the section from Hasle to Langnau of the Emmenthal railroad, and the section from Bevers to Filisur of the Rhaetian railroad. The Sion-Brigue section will be a continuation of the Simplon tunnel line, which was opened in 1906, with its northern exit at Brigue.

The electrified Berne-Thun line, connecting with the Berne Lötschberg-Simplon railway—the latter inaugurated in 1913—was opened for traffic in May last. It now provides excellent and frequent train connections between the Swiss capital, the Bernese-Oberland resorts and—in connection with the Lötschberg line—the Valais and Northern Italy.

The electrification works in the Bevers-Filisur line were completed by the middle of last April.

Summer Course for Engineering Teachers

To the Editor of ELECTRICAL WORLD:

SIR: Several of the large manufacturing companies, especially the electrical industries, conduct summer courses of work and study for professors and instructors of the various universities and technical schools. These courses cover a period of from four to six weeks throughout the summer vacation. The companies attempt to give the visiting teacher work which will permit him to gain experience and knowledge of any subject in which he is interested that comes within the scope of the manufacturing company. About one-fourth of the time is devoted to such shop or engineering practice. The remaining time is given to lectures and discussions, followed by inspection trips through the factories and to outside industries.

These courses are inspiring to the teacher and offer a direct return to those who will use their time to widen their experience and broaden their view of the industrial world. They impart to the teacher definite commercial information to introduce into his class work, as well as specific information regarding design practice and shop methods. He comes into contact with engineers and specialists of the highest standing in the field.

The association of a group of teachers from schools in as many different locations broadens the discussion and viewpoint. Living together for so long a time encourages close acquaintance and discussions of class administration, textbooks and curricula.

The unselfish spirit of coöperation on the part of the manufacturing companies has a tendency to advance the young engineer and thus the profession at large. Indirectly the industry is repaid through the quality of the technical men that come to it for employment. The engineering students are more thoroughly trained and gain a greater appreciation of the commercial requirements which the young graduate will meet when he enters the employ of the industry. The selection of men to suit the needs of the companies is made more satisfactory.

The Westinghouse Electric & Manufacturing Company has conducted nine such courses. Since these were started there have been in attendance 158 engineering teachers, representing about eighty engineering schools, from about thirty-eight states, the District of Columbia, Canada and Japan. The course this year was unusually attractive. Besides time spent in the shop or office, there were talks by leading engineers, followed by short inspection trips to the part of the works in which the speakers were especially interested. The products and methods of manufacturing were explained, after which there was a general discussion.

The evening talks and discussions were led by engineers or heads of departments and dealt with education, research, standards, purchasing, publicity, employment, works management and engineering apprenticeship. These discussions were illustrated with lantern slides, moving pictures, samples and bulletins.

Many inspection trips to the varied industries in the Pittsburgh district offered much specific information and afforded a broader outlook on the industrial world. The men in responsible charge of the manufacturing companies visited were uniformly courteous and helpful in making possible all the information practicable in the time available for the inspection.

One result to strive for in the summer courses will be improvements in the schools. These improvements may come from reorganization of the courses, as suggested by closer contact with the commercial needs, more definite information as to the requirements of the industry and better teaching methods resulting from the information and inspection gained.

It is through the medium of contact of the university with the various industries that the men graduated from the technical schools obtain the proper idea as to their treatment after leaving the schools.

It would be an excellent move for several industries in the same district to get together and offer such a course to a large group, thus widening the scope and benefits and also releasing the burden from any one industry.

C. W. PIPER,
Electrical Department, Purdue University, Lafayette, Ind.

Readers' Views and Comments

An Electrical Inventor of Days Past

To the Editor of ELECTRICAL WORLD:

SIR: Of the passing generation of electrical engineers there is probably not one who has not a distinct recollection of William Edward Sawyer as one of the most versatile and brilliant of the great electrical engineers and inventors of the electrical age.

On last Decoration Day the writer had the opportunity to visit Woodlawn Cemetery in New York City, and, having been informed that Mr. Sawyer was buried there, inquired at the office where his monument might be found. The clerk, after consulting the records, announced that if I would go to Grave 16, Lot 9, Range 103, I would find the grave. With a friend I sought the place indicated and, after an arduous search, found a marker inscribed: "Range 103." After another search for Lot 9, I inquired of a workman, who went to the marker and said, "It will be the sixteenth grave from here." He then measured the distance by pacing and, pointing to a flat piece of sod between two mounds, said, "There is the grave." "But," said my friend and I, "is there not some mistake? There does not seem to be any grave here, and there is no marker." "No," said he, "there is no mistake; these unmarked graves are all flat." "What a pity!" I said, "the man who gave to the world the best of his great gift of genius and died at thirty years of age, the holder of one hundred basic patents of electrical inventions now in universal use, thus to lie in an unmarked grave!"

There was rivalry between great electrical inventors, and competition, litigation and interference cases; but whatever personal antipathies may have been aroused by these during the lifetime of the inventors, I do not believe that there is in the long list of electrical engineers and inventors one who would willingly permit the grave of Mr. Sawyer to remain unmarked.

CHARLES F. WILCOX.
Brooklyn, N. Y.

[An obituary covering the work of William E. Sawyer, who died May 15, 1883, appeared on page 309 of the May 19, 1883, issue of the ELECTRICAL WORLD. Mr. Sawyer was one of the pioneers in the field of electric lighting. His inventions, it is said, formed the basis for the organization of the United States Electric Light Company, which retained him on a contract for several years which he did not fulfill. On severing his connection with that company he turned his attention again to electric lighting and organized a new company, the Sawyer-Mann Electric Light Company, to operate his incandescent system. The Sawyer-Mann company did not live long, and Mr. Sawyer started one or two other companies which shared the same fate. He then turned his attention to electric railroads. It appears that he was at work on an incandescent system at the time of Edison or Maxim if not before. In the beginning of 1881 Mr. Sawyer published a book on "Electric Lighting by Incandescence." At the time of his death it is said that he had several applications for patents in course of preparation to cover the distinctive features of his inventions. These inventions were bright innovations of old ideas rather than departures toward new principles. In a word, his genius was constructive rather than creative.

Mr. Sawyer's career as an electrician was begun under very favorable auspices. Unfortunately, however, his nature combined discordant elements of character; his disposition was governed by traits at once uncongenial and incompatible with each other, but he was not lacking in the essential qualities of ability and genius. His erratic and careless habits were perpetually at war with his talents and led him continually into difficulty. On May 5, 1880, Mr. Sawyer shot Dr. Steele. He was convicted and sentenced to four years' imprisonment at hard labor, but his health was such that his removal was considered dangerous, and the District Attorney in moving for sentence consented to delay for one month. Mr. Sawyer's death came before the time had expired.—EDITOR.]

STATION & OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

SIGNALING FLAG TO PROTECT TRIMMERS OF ARC LIGHTS

When This Is Placed on a Stool It Prevents an Automobile from Striking an Arc Lamp and Injuring the Workman

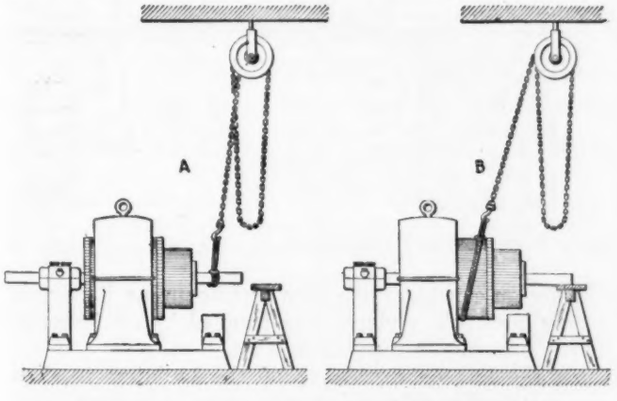
To protect its workmen from being struck by automobiles while the men are trimming arc lamps, the Georgia Railway & Power Company has adopted a plan of attaching a red flag to the insulated stool which is used to allow the trimmer to reach the lamp. The flag is inserted in a hole bored in the stool, and the stool is the last thing removed after the work is done. Before adopting this method a great many arc lamps were hit by automobiles and in several instances the trimmers were struck. In most cases it was claimed that the workman walked in front of the machine. With the use of the red flag, however, it is an easy matter to place the blame where it belongs. G. A. ILER,

Atlanta, Ga. Superintendent of Operation.

METHOD OF REMOVING GENERATOR ARMATURE

Can Be Conveniently Accomplished Even if Traveling Crane Is Not Available by Means of Chain Tackle and Wooden Stand

If the frame of a generator from which the rotor is to be removed is not in two parts, considerable care must be taken in withdrawing the rotor so as not to injure the windings. This can be easily accomplished with a traveling crane, but if one is not available the work can be done with only slightly greater exertion by the aid of a chain tackle and a support arranged as shown.



REMOVING ARMATURE WITH STATIONARY BLOCK-AND-TACKLE SUPPORT

First a rope sling is arranged so as to support one end of the shaft during the removal of the bearing and other obstructing parts on that end. The tackle should, of course, be supported vertically over the shaft. The rotor may then be pulled out, taking up slack to keep the shaft in a horizontal position to prevent rubbing the rotor against the stator. A support arranged as illustrated facilitates the safe removal of the armature.

Care should be taken not to let the opposite end of the shaft drop out of its bearing before a sling is placed around the rotor to support it. After this is done the rotor can be swung clear of the frame and supported on wooden horses or lowered onto the floor. Once the block and tackle are in place, the operation is performed in very much the same manner as when a travelling crane is used.

CHANGING LONG LINES FROM TWO-PHASE TO THREE-PHASE

Increased Demand on 1000-Mile, 6600-Volt Line Necessitates Converting the System to 11,000-Volts, Three-Phase

Owing to the rapid growth of the load of the Mount Whitney Power & Electric Company, which is a subsidiary of the Southern California Edison Company, the unusual step had to be taken of changing over a distribution system involving 1000 miles (1600 km.) of line from 6600 volts, two-phase, to 11,000 volts, three-phase. It was found that in no other way could the power distributing possibilities of the company be made to meet its necessities in the time available. The larger part of the load consisted of two-phase, 220-volt motors driving centrifugal pumps which raised water for irrigation, and the increase in the load was due to the extensions of the irrigated district and the consequent increase in the number and capacity of the motors in service. By star-connecting three of the 6600-volt transformers at the stations a line voltage of 11,400 was obtained and the capacity of the lines was correspondingly increased.

The most serious question, however, was to obtain such voltage and phases as would satisfy the consumers. Careful consideration was given to all of the possible methods of transforming from three-phase to two-phase which would permit of the use of the distribution transformers at present in service. No satisfactory scheme was found which would supply a balanced two-phase load by the use of three 6600/220-volt star-connected transformers; therefore, it was decided to cut the motors from two-phase to three-phase and to supply them from three 6600/250-volt star-delta-connected transformers.

Of the 1200 motors in service almost every available form and manufacture were represented, and the motors were of all ages and states of health. Each crew, consisting of two men, was supplied with a light truck for transporting them to the jobs and for moving such

of the motors as were not changed on the job. In many cases the crew would disconnect the motor at one plant and take it to the next plant and there make the change on the two motors. This would allow each of the men to be busy and thereby decrease the expense considerably.

Although some of the motors, ranging in size from 1 hp. to 150 hp. were located in pits as deep as 60 ft. (18 cm.), yet by careful planning a crew was able to average from two to four cut-overs a day. The coils of the motors were regrouped and connected in star. In some cases it was found difficult to cut into the coils, owing to their being baked into a solid mass, and at such times the procedure was to cut the two sets of coils in series and after removing the rotor apply 220 volts and heat up the motor. When the motor was hot it was found that the coils could be cut very readily. At the same time the motors were being changed there were crews changing the transformers. All of the transformers were removed and replaced by others. The line gangs changed as many as seven or eight installations during a day. This record is a high one, considering that the plants were often separated by several miles and it was necessary for the crews to travel from 15 miles to 20 miles (24 km. to 32 km.) before reaching the first plant.

The Mount Whitney Power Company, with the exception of one small section, is now operated at 11,000 volts, three-phase, and is proving to be entirely satisfactory.

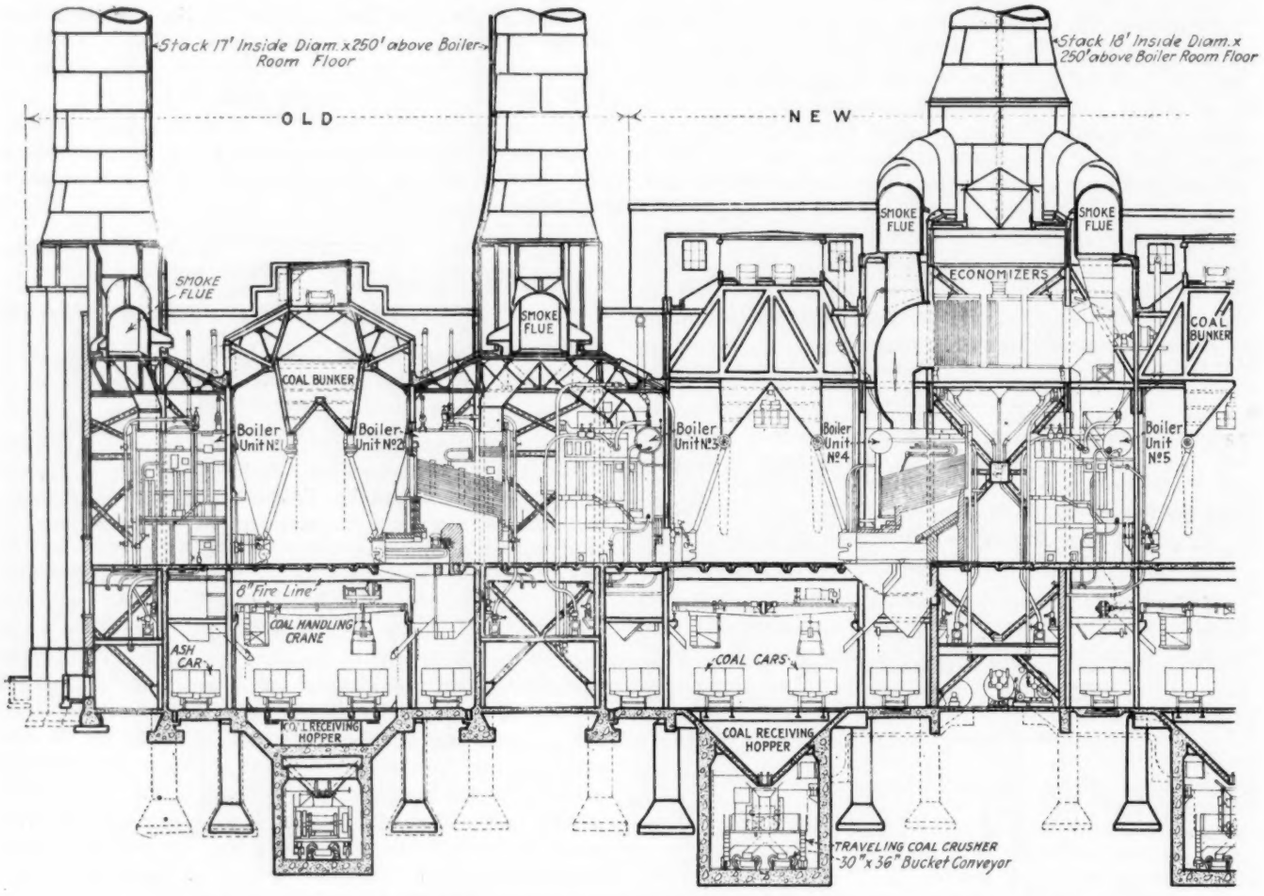
G. E. ARMSTRONG,
Protective Engineer.

Los Angeles, Cal.

BETTER STRUCTURAL DESIGN SAVES STEEL IN POWER HOUSE

Addition to Power Plant Built Two Years After First Structure Embodies Latest Designs, Which Are Combined with Original Equipment

Good practice in power-plant design has changed so rapidly in the last few years that stations built some time ago with an idea of possible expansion are now found inadequate even for the proposed change. The best design lies between the two possibilities of making the station entirely modern and effecting an efficient combination between the old and new sections. Furthermore, the rapid rise in construction costs influences the design considerably. The accompanying illustration shows how this problem was handled by an important power company in the Middle West.



POWER-PLANT ARRANGEMENT SHOWING NEW CONSTRUCTION EFFECTIVELY ADDED TO THE OLD

In the left or first aisle of the building is shown the installation of the first section of this plant, which was made in 1911-12, and in the second and third aisles is represented the second section, which was made in 1914-15.

The changes in boiler equipment and increase in size of boilers required considerable modifications in the structural-steel framing of the building construction. One of the most noticeable features in the sections shown is in the construction of the coal bunkers. The later installation has bunkers of very much greater capacity and built with simpler lines. The supporting members are utilized to form sides and partitions of the bins, thus making the materials serve two functions.

These bunkers are lined throughout on the inside with concrete anchored to the steel plates.

In the design of the steel work for this power house more than the usual consideration was given to the avoidance of wall bearings for beams, to the end that the steel erection might be completed in one operation. There is an important exception in the header-room floor, where two concrete walls were available for supporting the floor beams and were so used. These beams do not connect to the other steel work of the building, and there was no serious objection to designing them independently of the general framework. In the upper part of the building, however, all wall bearings were avoided so that the structural steel could be set complete without awaiting the wall construction.

In the building of the second section it was necessary to carry the conveyor pit excavation several feet below the adjacent foundations of the first section. A difficult situation was presented on account of the length of the bracing required to span the trench, but it was solved without any measurable subsidence of the old foundations.

Because of the boiler arrangement it happened that columns were used in pairs and that these pairs of columns were rigidly braced. In addition to serving the general purpose of bracing, this method also served to eliminate a part of the effect of eccentric loading.

A feature of the steel design partly shown is the bracing of the stack structure. The base of the chimney is approximately at the roof level and is supported on a steel tower. Instead of attempting to keep the bracing within the limits of this tower, it was connected into the steel framing of the building, thus getting the effect of a wider base and securing greater freedom from vibration.

These changes in design were largely responsible for a considerable reduction in the cost of structural steel for the newer sections of the plant and are hence of unusual importance now when construction costs are so high.

OBTAINING IMPROVED BOILER-ROOM SUPERVISION

Man Whose Job Is to Burn Coal Economically Is Placed in Charge of Firemen Who Perform the Actual Labor

Perfecting an organization of working forces with the specific object of operating the boiler room more efficiently has been the aim which a Middle Western company has successfully achieved by the employment of a non-technical "combustion engineer." The company's plant contains about 35,000 kw. of generator rating, and previously it has been the plan to employ a watch engineer in charge of both the turbine room and the boiler room. The result was that he spent most of his time in the turbine room and only took a real interest in the boiler operation when the steam pressure became low. Consequently the only thing the fireman watched was the steam gage.

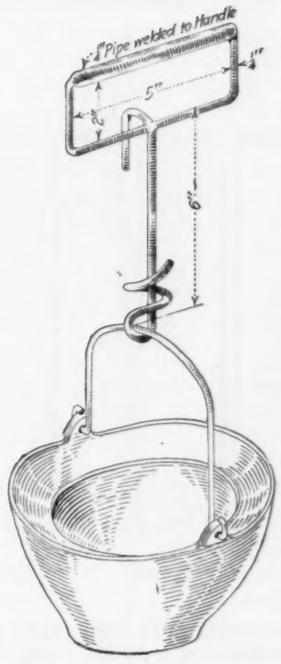
The new plan is to put one man in complete charge of coal burning in the boiler room. Besides watching the steam gage he will watch the fires to see that they burn neither too long nor too short, that combustible coal is not going over the end of the grate and that there are no holes in the fire or similar defects.

The combustion engineer is a non-technical man selected because he understands the practical common-sense things about economical coal burning and because he is studiously inclined and very willing to learn. He is capable of understanding and carrying out plans of operation given to him by the company's technical engineers.

MAKING THE OPERATING CONDITIONS MORE SAFE

Length of Linemen's Coats to Be Shortened and a Safety Solder Pot Hook to Be Adopted to Eliminate Accidents

Among the suggestions for which employees of the Commonwealth Edison Company, Chicago, have been awarded prizes are two that deal with overhead-line construction and operation. One suggestion was that



SAFETY SUPPORT FOR SOLDERING POT

hereafter when the company orders rubber coats for linemen it have them made 12 in. (30 cm.) shorter, or, in other words, three-quarters length, for the following reasons: First, the coats now come about 6 in. (15 cm.) below the knee, which makes it harder to climb poles; second, linemen always wear hip boots whenever they wear coats and long coats are not necessary; third, when linemen are climbing up or down the coats catches on pole steps and is likely to be torn up the back.

The solder pot hook which was recommended consists of a piece of ½-in. (6-mm.) round iron bent as shown in a device to eliminate accidents. It is considered a safety-first tool, and, in addition to being safe, is easy to fasten to the solder-pot bail. All that is necessary in attaching it is to place the bail on top of the hook, when the weight of the pot pulls itself down to the lowest point. In the descent the pot makes one and one-half complete turns to the lowest point which is sufficient to prevent it from falling when the linemen are holding it on a line preparatory to soldering. This hook was devised by William Nieswinter, one of the company's foremen.

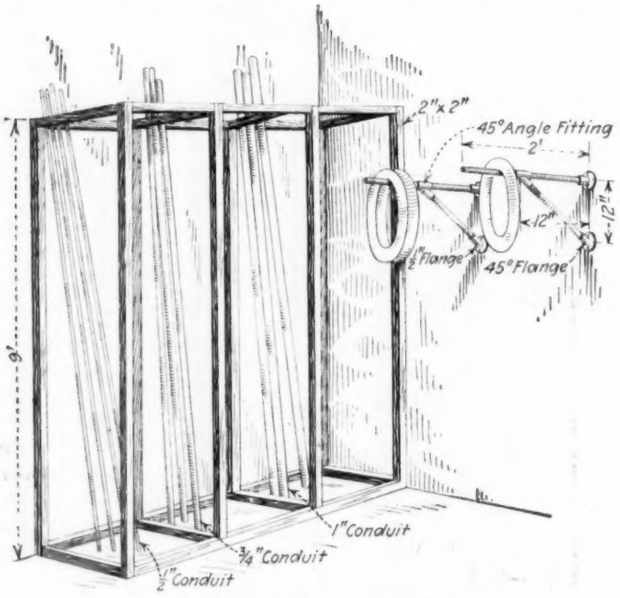
INDUSTRIAL APPLICATIONS

The Economical Utilization of Electrical Energy in Mills and Factories, Together with Practical Details of Installation, Control, Testing and Repair of Equipment Required

CONDUIT AND WIRE RACKS FOR PLANT REPAIR SHOP

Can Be Easily Constructed and Provide a Convenient Method of Keeping New Material—Prevent Damage to Conduit Threads

So much nondescript material finds its way to the industrial plant electrician's shop that it is a difficult matter to keep order. New material in stock, however,



RACKS IN ELECTRICIAN'S SHOP MAKE MATERIAL ACCESSIBLE AT ALL TIMES

can be arranged in some regular manner, the accompanying sketch showing how wire and conduit are kept in one plant.

As the bottom of the conduit racks are made of wood, there is no danger of the threads becoming damaged. The wire racks have been found extremely valuable, and their cost is easily repaid in the amount of wire saved which would otherwise become tangled and unusable.

BUILT-UP MICA FAVORED FOR USE IN COMMUTATORS

Hard-Baked Mica Best for Employment Between Bars and Unbaked fo Making V-Rings—Discussion of Other Kinds

The selection of mica for the insulation of commutator bars and for V-rings is usually based upon the type of motor being repaired, but the Commonwealth Edison Company of Chicago has found built-up mica to be the most satisfactory. India mica is generally too hard and domestic mica too brittle for use between bars. Domestic mica also has cracks and fissures which fill up with dirt and cause short circuits. Amber mica gives good service but it comes in such odd sizes that it is too wasteful for the average repair job. Hard-baked built-up mica was found best to be used between bars and the unbaked best for building up the V-rings. The unbaked mica is usually obtained in sheets 0.025 in. and 0.030 in. (0.63 mm. and 0.76 mm.) thick. Heavier mica would be difficult to bend and to cut into the required shape.

The same sizes of hard-baked mica with addition of 0.02 in. and 0.035 in. (0.5 mm. and 0.89 mm.) have been found sufficient stock to fill almost any size of commutator. In cutting up the unbaked mica for the V-ring insulation it is safer first to fit a piece of paper around the ring and then use this as a template.

MOTOR OPERATED WITH BURNED COILS REMOVED

Plant Electrical Engineer Finds It Unnecessary to Replace Five Coils When an Emergency Demanded Motor Back on Line

In reference to replacing burned-out motor stator coils with fixture wire, alluded to by Irving E. Sweazey on page 249 of the Aug. 2 issue of the ELECTRICAL WORLD, the writer has found that this is not always necessary. The motors of the Aroostook Pulp & Paper Mill operate on three-phase, 2200-volt and 550-volt energy, and an emergency of the kind referred to often arises.

If the motor is a small one and can be changed within twenty minutes, this is done; but if it can be repaired more quickly, the front end is removed (usually the coil or coils can be located without taking the rotor out) and the damaged coils leads are cut off. The good coils are then connected, leaving the damaged ones in place but not connected. This has been done several times and as many as five coils have been cut out of one motor. In the latter case the motor ran three days and nights until Sunday, when it was completely repaired.

In this plant one motor, a 3-hp., 550-volt, single-star-connected machine, has operated over a year with two coils removed, and notwithstanding this it develops full horsepower.

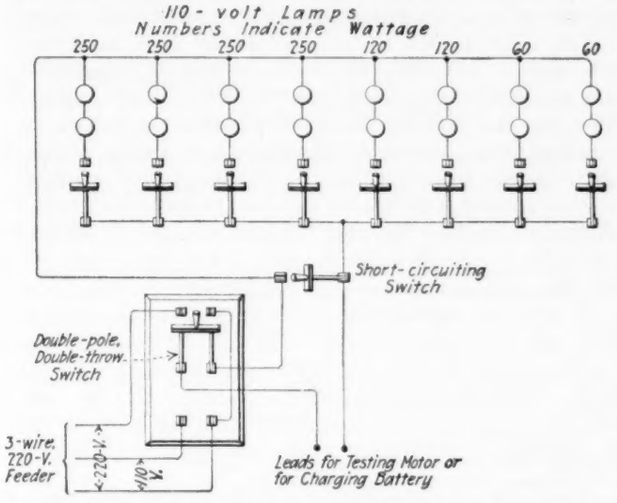
This method of repair can be accomplished in a great deal less time than the one previously described. However, the method may not always be the best practice because the life of the remaining coils in the motor is endangered. When coils are removed those that remain must, of course, carry proportionally more current and if the method described for the tiding over of emergencies is carried too far it may prove a costly expedient by necessitating the rewinding of all the stator coils.

Van Buren, Me. W. B. SMITH.

MOTOR TEST BOARD FOR USE IN PLANT REPAIR SHOP

It Consists Only of Sixteen 110-Volt Lamps and Can Be Used for Testing and Starting Motors and for Charging Batteries

Industrial-plant repair shops often have to test small motors or charge batteries. When a rheostat is not available for starting the motors a simple arrangement



MOTOR CAN BE STARTED BY LAMP RESISTANCE, WHICH CAN BE THROWN OUT BY SHORT-CIRCUITING SWITCH

like that shown herewith has been found to be especially valuable in a large plant.

When the motor to be tested is connected to the leads a small voltage will be applied to it when the knife switch on the smaller lamps are closed. Closing the rest of the switches successively will increase the voltage and cause the motor to gain speed. As it develops full speed, the closing of the short-circuiting switches cuts out all of the resistance and causes the motor to be thrown directly on the line. The proper time to close this switch will be indicated by the lamp becoming dim, indicating that the back motor is utilizing the full voltage of the line. The double-throw switch allows the use of either 220 volts or 110 volts, according to the type of the motor.

New York, N. Y. CHARLES E. SMITH.

HOME-MADE CABINET BUILT FOR STARTING APPARATUS

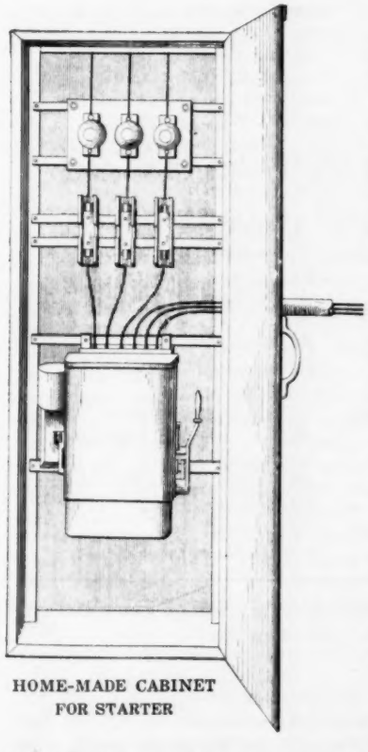
Designed to Prevent Fire from Starting in Textile Mill in Case Leads Become Coated with Residue of Raw Cotton

In the textile industry there are some processes where the fire risks are great and every precaution must be taken to guard against accidents. The atmosphere is laden with dust and with the residue from the raw cotton which the fans fail to take away. Streaks of cotton fluff, like a film or cobweb, fill the air, with the result that leads of apparatus not inclosed are soon covered with inflammable material. In some cases a film of cotton is formed so that oil is gradually being siphoned from the switch tanks, thus softening the insulation of the leads and making the cotton stick to them so as to be impervious to compressed air. When a short circuit occurs, however brief in duration, the cotton is ignited and the fire spreads with great rapidity, often igniting something else. After a few of these experiences a Canadian concern decided that the better course, where the apparatus must be installed in the same room as the textile machinery, would be to inclose the starting apparatus in a steel cabinet.

These cabinets consist of a $\frac{1}{8}$-in. by $\frac{3}{4}$-in. (3-mm. by 19-mm.) angle iron frame with the corners welded, and this frame is sheeted with No. 16 gage black iron riveted to the angle iron. The door is made of the same material and is strengthened by straps of $\frac{3}{16}$-in. by 1-in. (4.8-mm. by 25-mm.) flat iron riveted around the edge. A similar strap is also riveted across the middle. The door is hung on these hinges and has bolts.

The cabinet and door are lined throughout with $\frac{1}{16}$-in. (1.6-mm.) sheet asbestos. Fitting neatly inside the cabinet is a $\frac{1}{4}$-in. by $1\frac{1}{4}$-in. (6-mm. by 31-mm.) angle-iron frame bolted to the sides of the cabinet. This frame has $\frac{1}{4}$-in. by 1-in. (6-mm. by 25-mm.) flat-iron cross-bars suitably spaced, on which the apparatus is mounted. Two $\frac{3}{8}$-in. by $1\frac{1}{4}$-in. (9.5-mm. by 31-mm.) iron lugs riveted to the sides of cabinet near the top serve to hold the cabinet firmly to the wall by means of $\frac{3}{8}$-in. (9-mm.) expansion shields and coach screws.

The cabinet is raised 1 in. (2.5 cm.) off the floor to enable the door to swing freely. It contains the following apparatus: an isolating panel, three 60-amp. 600-volt barrier-type cut-outs and a compensator intended for a 20 hp. three-phase motor. Whenever it is necessary to stop the motor quickly, to avoid the time lost in withdrawing the bolts and opening the door the circuit of the no-voltage release coil on the compensator can be operated by means of a switch placed on one of the sides of the cabinet or in any convenient position. This type was adopted because it is self-closing; when the button is released the circuit is again closed ready for restarting. The conduit carrying the line and motor leads is carried directly to the cabinet and terminates in condulets rigidly fixed to it. In addition, the cabinet and conduit are separately connected to the ground wire to avoid the possibility of poor joints. When closed these cabinets are practically dust-proof. At all events the large particles of fluff which form the ignitible film are excluded, thus obviating the most serious risk. Even if the fire should start it cannot spread and cause damage.



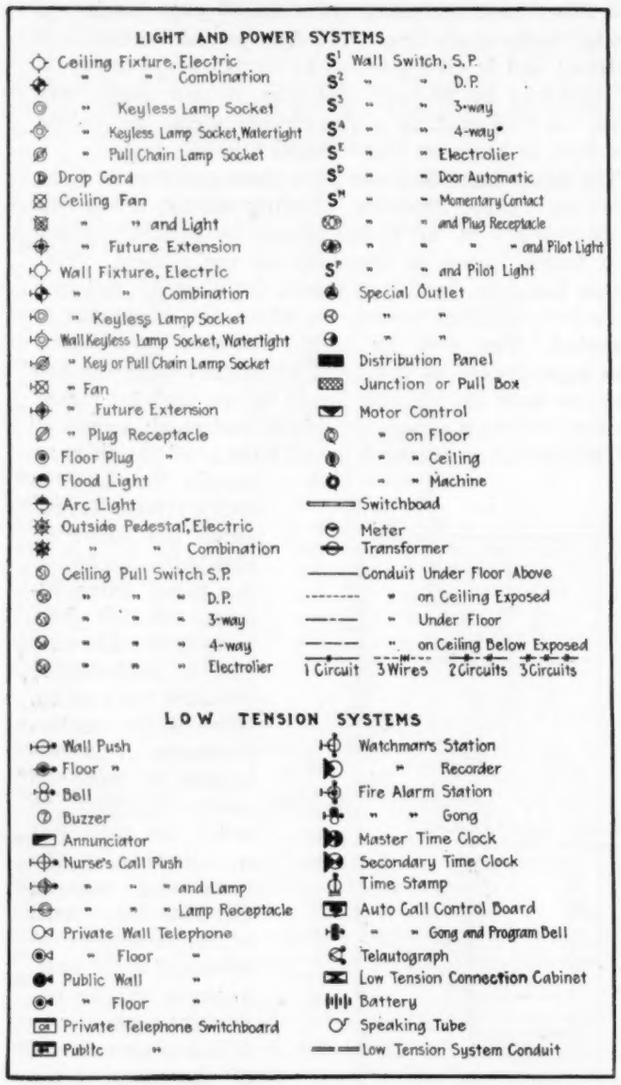
HOME-MADE CABINET FOR STARTER

Valleyfield, Quebec. L. E. WOOD.

FLOOR-PLAN SYMBOLS FOR ELECTRIC CIRCUITS

They Obviate Confusion and Allow Electrical Estimator to Determine Exactly Where Electrical Circuits and Apparatus Are

To obviate the confusion which sometimes arises when an electrical estimator tries to determine the location of circuits and apparatus, the Electrical Estim-



THESE FLOOR-PLAN SYMBOLS ARE EASILY MADE AND READILY SEEN ON THE DRAWING

ators' Association of Chicago has compiled a set of symbols which in the most part consist of circles instead of the half-shaded rectangles formerly used. In this way the circles are easily made by the architect and are easily seen on the drawing, although there is a maze of lines.

The principal reason for the plan was that architects do not make separate drawings for electrical circuits, plumbing circuits, steam-fitting circuits, etc., as formerly, but combine them all in one drawing. Overlooking lines on drawings has often caused estimators to lose money, and the new set of symbols, it is thought, will obviate such loss and in addition be useful to the plant electrician when he is engaged in drawing plans of new circuits.

CONNECTED MOTOR CAPACITY COMPARED WITH DEMAND

Data on Forty-two Direct War Industries at Worcester, Mass., Showing Load Conditions in Such Industrial Plants

Both consumer and seller of electricity are some time or other interested in the probable power demand of a certain horsepower in motor equipment. While the accompanying relations are not necessarily the same for differently sized industries of the same kind, they do give a good idea of the conditions that exist in actual plants. A study of the connected load and demand of direct war industries at Worcester, Mass., shows that the ratio of connected horsepower (in kw.) to the kw. demand, which is comparable to the diversity factor, ranges from 0.87 in the plants making canvas and duck cartridge belts, towels, etc., to 10.92 in plants making handcuffs. By shifting the motors in these

WORCESTER (MASS.) DIRECT WAR INDUSTRIES, LOAD DATA—WORCESTER ELECTRIC LIGHT COMPANY, 1918

Class of Work	Connected Hp.	Kw. Demand	Ratio of Connected Hp. to Kw. Demand
Looms for canvas-duck cartridge belts, towels, etc	1200	1034	0.87
U. S. olive drabs	559	456	0.92
Oxygen and nitrogen	390	312	0.93
Shirting, flannels, woolens	320	246	0.97
Gun mounts, parts, shell tools, torpedo equipment	100	75	1.00
Canvas machine-tool products	400	296	1.00
Machine manufacture	352	261	1.00
Malleable iron	100	70	1.07
Machine screws, bolts	1200	820	1.09
Army woolens	150	104	1.10
3,000,000 brass hoops, wire and wire rope for U. S. fleet	1568	1700	1.13
Engine lathes	576	278	1.13
Army prison cloth	331	210	1.17
Army blankets	555	344	1.20
Pump castings for U. S. fleet	170	105	1.21
Machine knives	168	105	1.23
Tent tops	150	91	1.23
Set cap and machine screws	325	296	1.24
Shoes	100	58	1.29
Cartridges and belts	400	231	1.29
Truck chains and sprockets	514	293	1.31
Valves for Emergency Fleet Corporation	105	80	1.31
Stretchers, signal staffs, fuse-cap boxes	190	101	1.40
Ammunition trucks and gun platforms	218	112	1.45
Machine and tool manufacture	110	56	1.47
Ammunition	451	225	1.50
Rifle parts, shell adapters	538	260	1.55
Envelopes for United States	155	70	1.66
Buckles for belts	391	174	1.68
Machinery for arsenal and navy yards	284	121	1.75
99 per cent castings for United States	365	150	1.81
Pump equipment for destroyers	147	55	1.99
Booster casings for HE shells, adapters for 75 mm	255	128	2.00
Castings for arsenals, shipyards	750	265	2.17
Machine parts, pressed metals	625	220	2.12
Wrenches	585	207	2.17
Heel plates, gas-shell parts	140	48	2.18
Olive drab meltons	600	206	2.91
Wire goods	600	153	2.92
Washers for Emergency Fleet Corporation	196	25	5.85
Steel-mill construction	205	25	6.12
Handcuffs	73	5	10.92
Total	17,620	9,994	1.32

plants a higher ratio might have been obtained, but this could only be done by careful study of load conditions. It might have even been possible in some instances to reduce the connected horsepower and carry the same load if the machines were overmotored.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Methods for Increasing the Use of Electric Light, Power and Heat

A DIFFERENT ANGLE ON THE TURNOVER OF CAPITAL

When Public Thinks Utility Is Making 50 per Cent on Its Investment, Utility Can Score by Showing the Facts

In a recent rate discussion between a committee of a local city council and a city manager the valuation of the property had been admitted. The discussion centered around the belief that the company was earning too much on its investment. So the utility man asked the committeemen how much they thought his company earned. They advanced the view that the figure was probably around 50 per cent. He then showed them that the total income of the company was only 26 per cent of its valuation, which they agreed was right. He pointed out that 26 per cent, therefore, was the maximum his company could earn if its income was all profit.

Then he asked them what percentage they thought the company was entitled to earn. They agreed that 7 per cent was a fair figure. This amount the utility man then deducted from his 26 per cent. Next he showed that his taxes amounted to 1.8 per cent, and he deducted this also from his balance of income. In this way he went on down through his entire scale of expenses, reserving operating expenses until the last. When this point was reached it was obvious to all those who had been following the discussion that not enough income remained to meet the company's operating expenses.

This was the point which the utility man wished to emphasize. With the stage thus set by means of his convincing figures, he drove the lesson home with vigor. Later, in speaking about the incident, the central-station man remarked that this sort of analysis afforded a good angle from which to present to the public the difference between ratio of capital turnover in the utility business and that which obtains in an ordinary mercantile business.

RHYMES ATTRACT THE UNWIRED HOUSEHOLDER

A. P. Broadhead Writes Jingles to Publish in Newspapers and Get the Attention of the Man Who Should Use Electricity

A. P. Broadhead, division superintendent of the Southern Canada Power Company, Granby, Quebec, is a firm believer in the power of jingles in his newspaper "ads." "Poetically getting after unwired houses" has proved most satisfactory in its results, he writes. No matter how foolish they are or how many laws of poetic art they break, the rhymes seem to "stick" in the minds of readers. Moreover, he thinks, the swing of a verse will often carry a reader along to the end, whereas he would perhaps stop in the middle of prose text to skip to the end. Mr. Broadhead writes these verses himself and distributes them among the local newspapers. "Besides the commercial value of this method of advertising," he says, "we find that a friendly interest is aroused and little remarks dropped which do a lot of good."

TALKING TO THE CUSTOMER ABOUT THE HIGHER BILLS

Middle Western Central Station Frankly Discusses with Consumers the Reasons for Increased Cost of Utility Service

The following self-explanatory talk was issued in a folder of convenient size for use as an envelope stuffer by the Wisconsin-Minnesota Light & Power Company for distribution to its customers. This piece of literature is thought to have a particular element of timeliness now, since the fall season will undoubtedly bring a large number of complaints when the change in working hours is made at the same time as the usual increase in fall lighting:

We often hear the question asked, "Why does my gas and light bill keep creeping up?" You are taking greater advantage of the service. You will remember when you first put in the gas and later on put in electric lights. Then you only used the gas to cook breakfast and to show the neighbors that you had it. Now you use gas exclusively for cooking and heat all the water with gas. Why? It is cheaper, cleaner and more convenient. You can now do anything with gas cheaper than coal except to heat the house. Now for electricity. You do not use this service just for light alone as you intended when you first put it in. Remember when mother first begged you to put in the lights, and you finally put a stingy little fixture in each room and then burned the coal-oil lamp to keep the bills down during the winter months, and when the electric lamps were lighted it was only for a short while. You almost wore that little rubber switch or button out turning them off after the kids. Now what? You have replaced that little fixture with an indirect type, thrown care to the winds, just like riding in a Packard in the cool of the evening. You have almost forgotten where the turn-off switch is. You know it is now on the wall, controlling all the lights, whereas in the old days there was one on each light.

What has brought all this change about? Why, the new lights, of course. They do not use so much electricity. You now get three times as much light for the same money, and the price, instead of being 20 cents per kilowatt, is now 10 cents, or rather 10½ cents since the war. Don't you wish that everything else had gone up in the same proportion? What? Great! Well, that is service.

Now you still wonder why your bills have gone up. Think of the iron that the boy sent home to his mother, then the vacuum cleaner, and the washer and ironer, and the sewing machine, all run with little motors and at such small cost. The motor in the home will do just what it will in the office or factory—increase efficiency or output and reduce operating costs.

Now, getting back home again, mother uses a curling iron. Now it's electric. She makes toast every morning on the electric toaster and uses the electric percolator when she has company—she is not quite weaned away from the old

coffeepot as yet—and sister is now making fudge or rarebit on the electric chafing dish, so safe and convenient—it doesn't cost much either. When it is added in with all the other things the light bill is not so big after all. Now be honest; don't you think so too? Give the old, and we might say faithful, servant a chance as long as you can get what you want.

Remember how hard it is to find a washerwoman and how many times you have changed them since you first put in the lights. After all, don't you think that electricity and gas are pretty faithful old servants—always there like magic at the twist of the wrist—and, my! how they have grown! Don't kick! It is the cheapest and best service you get for your money to-day.

Now be honest with yourself and your servant. Don't you think you are getting your money's worth?

EFFECT OF SURCHARGE ON CENTRAL-STATION EARNINGS

Company with Many Small Properties Finds Net Result Is 6 per Cent Increase, but Believes Actual Effect Greater

A central-station company operating in the Middle West recently looked over its income figures to obtain an idea of what effect the 20 per cent surcharge had when it was applied in most of its towns. The data showed that the net result was an increase of between 6 per cent and 7 per cent in the company's gross earnings. Further study of the situation, however, led to the belief that the actual effect was greater than this. That is, if the surcharge had not been applied, the properties would have shown a 15 per cent loss in gross earnings. Hence the surcharge really did produce a greater increase in gross earnings than the actual data showed.

These data were secured by a company which operates in fifty small towns and cities, supplying energy from transmission lines fed from its twenty-three generating stations. The gross earnings of the company for 1918 totaled $1,408,000.

SIGN CONTRACT PROVIDES COMPLETE INFORMATION

Shows Each Customer What It Will Cost Him to Buy and Maintain Electrical Advertising Over Any Desired Period

A form of contract which is used by the Nebraska Power Company, Omaha, in connection with all of its electric sign sales is somewhat unusual in that it covers in one item the cost of the sign and the cost of all of the service which an electric sign customer will need. The contract provides that the central-station company shall erect and connect the sign, shall provide it with lamps and maintain it for a flat charge based on monthly payments. These payments are so worked out that they will liquidate the cost of the sign, pay for the energy and the lamps used, as well as for repainting approximately, every six months, and provide for turning the sign on and off at regular intervals.

The contract has the advantage of permitting merchants to buy electrical advertising in the same way that they buy any other advertising, and they can tell in advance just how much per month their electrical advertising will cost, since the entire amount is quoted in one figure in the contract.

RECORD OF CUSTOMERS KEPT IN COLUMBUS, OHIO

Columbus Railway, Power & Light Company Does Not Use a "Contract," as Stated Erroneously, but Has a Form of Application for All Consumers

Through error an old form was printed in the article on "Records of Customers Kept in Columbus, Ohio," printed in the ELECTRICAL WORLD of July 12, 1919, page 81. Among the forms illustrated was a contract. The Columbus Railway, Power & Light Company has not used a form called a "contract" since June 21, 1917. The form of application for service illustrated herewith is the only agreement between the company and its consumers, from the smallest to the largest.

Application for Electric Service

.....
(hereinafter called the Consumer) hereby makes application to The Columbus Railway, Power & Light Company (hereinafter called the Company) to furnish to

the Consumer at .....

all electric energy required or used by the Consumer for .....
from the date service begins under this Application, and thereafter until 30 days' written notice to discontinue shall have been given by either of the parties hereto to the other.

The Consumer agrees to pay monthly for all electric service at the rates specified in Schedule ..... of the Company's rates now or hereafter on file with the Public Utilities Commission of Ohio.

The Consumer agrees to pay a minimum monthly charge of .....

This Application cannot be transferred or assigned by the Consumer.

All agreements, terms and conditions on the back of this Application shall be deemed a part hereof.

.....
Consumer.

Dated ..... 191 .

THE COLUMBUS RAILWAY, POWER & LIGHT COMPANY,

By .....

Bills to .....

Guarantee No. .....

Circuit .....

Route .....

Classification .....

APPLICATION FORM USED BY COLUMBUS COMPANY

METHOD USED TO PREVENT CURBSTONE METER READING

Dummy Sheets Placed in Meter Reader's Route Books Without His Knowledge Provide a Valuable Check on His Work

Several Middle Western utility companies which during the labor shortage found that gross inefficiency existed in their meter departments have been casting about for means of preventing meter readers from entering readings in the books without visiting the customer's installation.

One of the most successful methods of preventing this practice, according to the utility managers, is to place "dummy" sheets in each meter reader's route book. Two or three such sheets, covering installations which do not exist, are placed in each route book. A record of the number of these sheets is kept by an office employee who is entirely trustworthy, and if the false records are not detached by the meter reader this fact furnishes conclusive proof that he has not followed the route laid out for him.

ADVERTISING METHODS FOR CENTRAL STATIONS

L. D. Gibbs Shows How Properties Can Take Advantage of Co-operative Helps and Put Themselves in Strongest Possible Positions

"If central stations will intelligently apply only 1 per cent of their annual gross receipts to advertising, they can take advantage of every form of coöperative help to the fullest extent and put themselves in the strongest possible position."

This is the conclusion of L. D. Gibbs, superintendent advertising department of the Edison Electric Illuminating Company of Boston, expressed in his paper before the convention at the Sales Managers' Association at Association Island, N. Y. Mr. Gibbs reviewed and analyzed advertising policies of central stations and made recommendations for improved practice. He began by pointing to the power of advertising in the war. Whenever the government discovered a need to be met or a gap to be filled, advertising rose to the situation.

"As a result of this proof of what advertising can do," said Mr. Gibbs, "our controlling business men have a higher appreciation of the value of advertising service than they ever had before, an appreciation which they never would have got—in the central-station business at least—from anything we could have said or done in the ordinary way."

A study of questionnaires received from members of the sales managers' convention shows, Mr. Gibbs maintained:

1. That the annual expenditures for all forms of advertising have been modest.

2. That, although most of the companies report definite budgets, their advertising expenses have really been, for the most part, contingent upon what the managements felt were the exigencies of the situation, and the expenditures have, for the most part, become "budgets" only after they were placed upon the ledgers at the close of the year in which they were made.

3. That consistent campaigns based on appropriations have been running for comparatively only a few years out of the relatively long existence of most of the corporations as public service companies. The notable exceptions are the large companies.

4. The distribution of the advertising charges upon the accounts of the departments most obviously interested appears to be general. One company of the twelve reporting makes its advertising expenditures stand by themselves—apparently a general operating expense; another divides these expenses between new business and a "publicity" account. These methods of charging are perhaps as indicative as any of the appreciation of advertising. They show that in those companies they have reached the point of admitting advertising to the ranks of the constructive activities of their companies.

5. Six of the twelve companies have advertising departments, and six conduct the advertising under the direct supervision of the sales departments. Of the three companies that had not reported when this paper was written, two have advertising departments.

6. Only two companies of the twelve have conference or advisory committees which discuss sales and appliance campaigns well in advance of the time when they will become active and pass in a general way upon the advertising copy.

7. Only in a few instances is it reported that campaigns along special lines have been conducted for any extended period. This shows a failure to get the most out of advertising expenditures.

8. Eight out of twelve have used street-car card advertising, five used illuminated billboards, three have used advertising on the backs of their monthly bills, two use stickers attached to their bills, one makes inclosures with bills. All have used so-called "follow-up" or "direct-by-mail" advertising, and all have used newspaper advertising. Only two report the use of "house organs" at the present time, but probably most of the companies have at one time or another used this medium.

9. Only two report that their advertising programs are laid out a year in advance; one reports that an effort is made to conform to this plan, and the others, for the most part, report no policy. Copy is apparently prepared by practically all of the companies just previous to its use.

10. None of the companies attempts to check advertising results except on "follow-up."

11. Five of the twelve use advertising agencies to handle their newspaper advertising; only one reports employment of an adviser, and with four of the five companies the agencies do their work for the commissions they receive from the newspapers.

12. Four companies would use any possible extra appropriation entirely in advertising; four would divide the appropriation as needed; one would divide the appropriation one-third for increasing the sales force and two-thirds for extra advertising; another would give two-thirds to increase the sales force and one-third to extra advertising; one would use the appropriation for increasing the sales force.

"The answers to question 12 showed clearly," said Mr. Gibbs, "an appropriation of the value of advertising for special drives such as any extra appropriation would probably be used for, and that appreciation must be predicated upon results from regular advertising.

"Further development of central-station advertising can only come with a clearer understanding of what we want to gain, so that the campaigns can be effectively directed."

When a big emergency arises, when the public must be informed quickly, companies turn without a moment's hesitation to publicity. Mr. Gibbs adds, however, that "continuous publicity, explaining the growth, availability, kinds of service, reductions in rates, comparisons of costs of electric service with other kinds, business policies, etc., should be kept up. Executives are not yet ready to adopt this policy, deterred possibly by memories of the costs of special campaigns along these lines and fearful that the cost of continuous campaigns would be proportionately greater."

The conference method of laying out advertising campaigns for at least a year in advance is recommended by Mr. Gibbs as the quickest way to accomplish results.

Mr. Gibbs also called attention to the erroneous belief which "still seems to exist that a few columns of paid advertising will influence a newspaper to treat us kindly, which some people still think means leaving us alone. Long experience in the newspaper business and a wide acquaintance with newspaper publishers, editors and reporters have proved to me that the paper that has a tangible influence will not be swerved by a little advertising. What really does happen is that as a result of the personal acquaintanceships developed in the course of business central-station men and newspaper men are brought together. Each side finds the other human. The newspaper men find there is no mystery about the central-station business, and mutual understanding promotes good fellowship—the really satisfactory basis of all business relations. But let us try some of the other mediums more continuously and efficiently; give attention to the checking of results; practice some 'follow-up' on ourselves."

DIGEST OF ELECTRICAL LITERATURE

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Particulars of a 56,000-Sq.Ft. Surface Condenser.—This condenser is of the Worthington type and has a total of 56,000 sq.ft. (5200 sq.m.) of tube surface, including that for the heater. There are 54,500 sq.ft. (5060 sq.m.) of condensing surface and 1500 sq.ft. (140 sq.m.) for the heater. The condenser will serve a 35,000-kw. turbine in a large power station in the Middle West.—*Power*, July 15, 1919.

Testing Alternators at Reduced Load.—TOGNA.—Dealing with the employment of a flux meter, the author maintains that one is able, with greatly reduced power and with direct current only, the alternator remaining at rest, to determine experimentally and directly the excitation for any load whatever, as well as the reaction due to the armature and the exact losses in the field.—*Revue Générale de l'Electricité*, June 21, 1919.

Eddy-Current Production in Laminated Iron Cores.—R. BACH.—The problem can be attacked in two ways, namely, (1) by consideration of the eddy currents in iron cores and (2) by consideration of the reflection and refraction of electromagnetic waves. The author here proceeds by the second method. The mathematical treatment is lengthy and must be consulted in the original.—*Science Abstracts, Section B*, June, 1919. (Abstracted from *Archiv f. Elektrot.*, Jan. 26, 1919.)

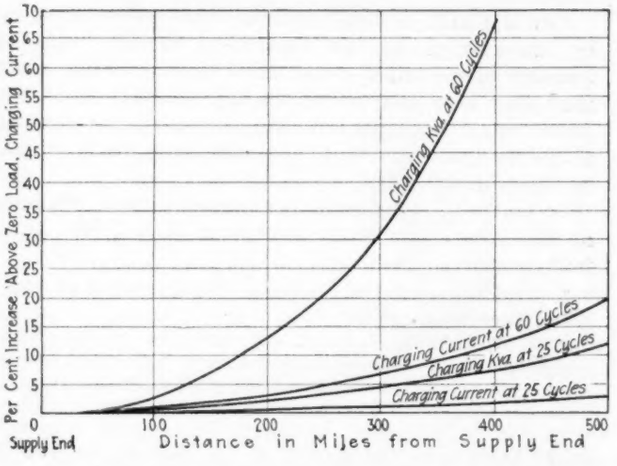
Experimental Method of Analysis of the Properties of Alternators.—A. BLONDEL and F. CARBENAY.—The authors desire to show how, in studying the armature reactions of alternators, it is possible by relatively simple means to analyze all the coefficients which enter, either for the purpose of predetermining the characteristics of the machine or to ascertain the factors affecting similar machines to the one under experiment. They establish different variables applying either to the static or the dynamic state of the alternator—that is to say, to the alternator at rest or in full motion—and illustrate by a concrete example their exposition of the methods and formulas employed to determine the principal fluxes, the reluctances, the leakage fluxes, and the coefficients of direct and transverse reaction.—*Revue Générale de l'Electricité*, June 7, 1919.

Generation, Transmission and Distribution

Convenient Method of Calculating Trash Racks.—E. BALBACH.—A table and formulas by means of which designers can readily determine length of panels between supports for various spacings and sizes of bars.—*Canadian Engineer*, July 17, 1919.

Inductance of Loading Coils and Their Insertion in Cables.—E. S. RITTER and A. MORRIS.—The general method of treatment of windings of iron-core coils in series and in parallel, assisting and opposing, is discussed by the authors. Measurements on certain types of these coils are described. The general requirements of loading-coil design are then set forth and the direction of the latest progress in this design is indicated. The inductance of phantom circuit coils for submarine and underground cables is also discussed, together with the problem of the insertion of loading coils into the cable, the faults met with and tests to be made during and after construction.—*Post Office Electrical Engineers' Journal*, July, 1919.

Electrical Characteristics of Transmission Circuits—II.—WILLIAM NESBIT.—In this number of the series the author continues the discussion of the reactance determination, in particular for three-phase, irregular flat or triangular spacings. It is said that the distance


Per Cent Increase Above Zero Load Charging Current
Charging Kva at 60 Cycles
Charging Current at 60 Cycles
Charging Kva at 25 Cycles
Charging Current at 25 Cycles
Supply End
Distance in Miles from Supply End

ERROR IN CHARGING CURRENT CALCULATION AT ZERO LOAD DUE TO VARIATION OF VOLTAGE ALONG LINE

between conductors to be used in the formula in this case is $D = \sqrt[3]{ABC}$, where A, B and C are distances between conductors. For three-phase regular flat spacings use $D = 12.6 \times A$, A being the distance between the middle conductor and one outside. The formula for determining capacitance is then put down and a complete series of tables is offered for the ready determination of capacitance and charging current per mile for various conductor spacings, sizes of wire, etc. The writer calls attention to the error in the determination of charging current which is produced by assuming a constant voltage along the lines. If the voltage at the load end is used and the charging current calculated on this basis, the error will be increased as the length of the circuit increases, particularly for the case of 60-cycle energy. The curves shown herewith indicate an approximation to this error at no load.—*Electric Journal*, August, 1919.

Water Power in France.—The second annual treatise on this subject published under the direction of Prof. Auguste Pawlowski, director of the *Journal de la Houille Blanche*. The 169 pages are divided into five parts, of which the first part deals with water power before the war, the technique of water power, water

power during the war, water-power legislation, potential hydraulic power of Europe and North America, and French bodies concerned with water-power development; the second part with the chief distribution companies in France; the third part with electrochemical and electrometallurgical companies; the fourth part with traction, and the fifth part with the course of the principal French water-power securities on the stock market from December, 1913, to October, 1918. For thoroughness and completeness the publication seems to leave nothing to be desired.—*Annuaire de la Houille Blanche Française*, 1918-1919.

Division of Wattless Load Between Stations Operating in Parallel.—G. BRECHT.—If several generating stations are connected in parallel by tie lines, the division of the wattless load between them may be controlled by adjusting the excitations at the various stations. There is, however, a particular division of wattless current for which the sum of the losses in the tie lines and in the separate stations becomes a minimum. For instance, if two stations of resistances r_1 and r_2 are connected by a tie line of resistance r_a, and if the excitations are such that the wattless powers furnished by the stations are l_1 and l_2 respectively, then the wattless power transmitted over the tie line for which the losses are a minimum is given by $(r_2 l_2 - r_1 l_1) \div (r_1 + r_2 + r_a)$. Furthermore, it is shown that the phase displacement in the tie line decreases as the power transmitted over that line increases, and as the ratio of r_a to the resistances r_1 and r_2 increases. A leading current should flow in the tie line if the load is passing from station 1 to station 2 and $r_2 l_2 < r_1 l_1$, or if $r_1 = r_2$ and $l_2 < l_1$. A particular case is worked out from which it is apparent that it is by no means correct to choose the power factor in the tie line according to the commonly adopted plan of adjusting its value so as to be equal to the combined power factor cos ϕ, obtained by combining vectorially the loads on the two stations, where $\tan \phi = (l_1 + l_2) \div (m_1 + m_2)$ and m_1 and m_2 are the watt components of the load supplied by the two stations respectively. In the particular case chosen it is found that the total losses for this value of the power factor are 35 per cent greater than the minimum. It is sometimes said that the power factor in the tie line should be taken as equal to that of the load on the station being fed over the tie line. This is also shown to be a fallacy.—*Technical Supplement to Review of Foreign Press*, May 27, 1919. (Abstracted from *Elektrot. Zeits.*, March 20, 1919.)

Traction

Electrification of the Melbourne Suburban System.—E. P. GROVE.—This is the fourth article of the series and deals particularly with the fifteen substations which have been provided for the Melbourne (Australia) system. In these various substations may be found rotary converters of Siemens Brothers Dynamo Works, the British Westinghouse Electric & Manufacturing Company and the General Electric Company. The Siemens and Westinghouse rotary converters are started by induction motors, while those of the General Electric Company are started at half voltage on the alternating-current side by means of taps on the transformers with a throw-over switch.—Melbourne *Commonwealth Engineer*, June, 1919.

Electric Braking.—It is pointed out that regenerative braking has been in use for some time on three-phase systems. It is only within recent years, however, that this method of regeneration has been applied to single-phase and direct-current systems. The writer states that the split-phase system is preferable to the single-phase for the purpose of regenerative brakings, citing, for example, the system of the Norfolk & Western Railroad in West Virginia. It is then pointed out that the Chicago, Milwaukee & St. Paul Railroad has successfully put into operation direct-current locomotives which take advantage of the regenerative braking system on the mountain grades.—*London Times Engineering Supplement*, June, 1919.

Installations, Systems and Appliances

Electrical Equipment Used on Submarines.—H. C. COLEMAN.—The author deals particularly with the main propulsion motors and their control. He also states the storage-battery requirements, outlines the use of auxiliary motors and points out the lighting and heating requirements.—*Electric Journal*, July, 1919.

Grounded-Neutral Transmission Line.—W. E. RICHARDS.—The paper describes the conditions on the system in Toledo, Ohio, which was originally delta-connected. Serious trouble was experienced when a short circuit occurred, especially with synchronous apparatus connected to the line, which invariably failed, owing to the voltage drop occasioned by the severe short circuits on the delta system. This trouble was overcome by changing the transmission to a Y system with the neutral grounded. The effect of a short circuit with the new connection has been decidedly minimized.—*Proceedings A. I. E. E.*, August, 1919.

A New Devolpment in Motor Starters.—The contact and inclosed type of motor starter which was developed particularly for submarine work is said to be useful where available space is limited. The window in the cover permits a ready observation of the progress of the controller arm over the contacts. It is said that there is some difficulty in using only one blow-out coil to obtain a satisfactory magnetic field for all controller fingers. In this respect the starter under consideration is exceptional, as, owing to the construction, the magnetic field produced by the blow-out coil moves with the arm from contact to contact, and it is therefore not only in the right direction but is also always concentrated in the place where it is needed—London *Engineer*, July 11, 1919.

Electrophysics and Magnetism

Arrangement of Electrons in Atoms and Molecules.—IRVING LANGMUIR.—In this article the author has set forth a new theory of atomic structure which has received a great deal of appreciation from scientists in the country. The main assumption in this theory is that the electrons are stationary and situated in concentrated shells. By means of this theory the author found that it is possible to explain the periodic properties of the elements and also succeeded in evolving a new view of valency which bids fair to replace all the older views on the subject.—*General Electric Review*, July, 1919.

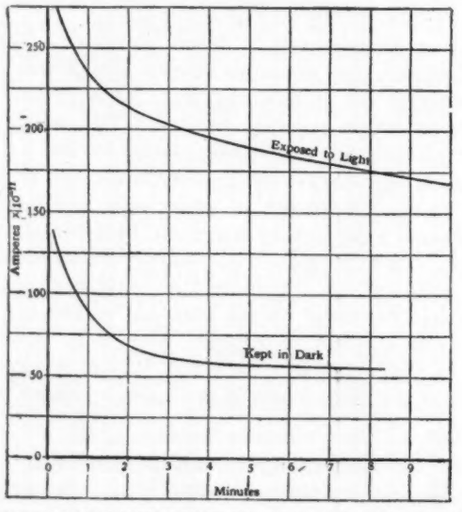
Surges on Switching in a Coil of Two Turns.—L. DREYFUS.—A mathematical article discussing the actions which occur when a coil (assumed for the sake of simplification to have only two turns) is connected to a source of constant potential. The effects of the mutual capacity and induction of the turns is taken

into account, and the coil is also assumed to have a moderate capacity to earth. In this latter respect the investigation differs from that of Rogowski. The original article must be referred to both for the mathematical methods employed and for the results of numerical examples which are illustrated by numerous tables and graphs.—*Science Abstracts, Section B*, June, 1919. (Abstracted from *Archiv f. Elektrot.*, Jan. 8, 1919.)

Study of the Distribution of Current and Potential Along a High-Tension Distribution Line.—LÉON DRIN.—This study was undertaken during a long captivity in Germany, and the author, with no access to previous studies on the subject, worked out his calculations *ab ovo* before proceeding to the geometric solution that he had in view. This consists of determining the current and the potential along a high-tension line by the aid of characteristics that may be defined as the locus of the vectors of the voltages and the currents for each element of the line.—*Revue Générale de l'Electricité*, July 5, 1919.

Electrochemistry and Batteries

Conduction in Liquid Dielectrics.—J. E. SHRADER.—A discussion of the electrical properties of some common liquid dielectrics. The author points out that a part of the initial current inrush into a dielectric is due to instantaneous condensive charge and a part to absorption and to conduction. Some difficulty arises in the study of absorption current during the first few seconds owing to the slow response of sensitive direct-current measuring instruments. The author offers a number of curves showing the current decay. It is also pointed out that the insulation resistance as defined by Ohm's law is an uncertain term, since it varies with applied voltage, increasing the voltage for some materials and for others decreasing. Curves of this sort are presented. The action of light on insulating oils was also studied, and the accompanying curves show the very serious decrease in insulation resistance of insulating oil due to exposure to light.—*Electric Journal*, August, 1919.



DETERIORATION OF INSULATING OIL DUE TO EXPOSURE TO LIGHT

Accumulator Batteries on Submarines.—G. FERETTI.—It is well known that when an accumulator is fully discharged at a given rate it is possible to draw from it supplementary energy if the further discharge is carried out at a lower current. It is, however, generally thought that the said supplementary energy is negligible in comparison with the first. The author has experimented upon large accumulators for submarines of 3000 amp.-hr. capacity at 100 amp. He has found that the supplementary energy which can be drawn from a cell at the lower current intensity is far from being negligible. In one case, for instance, upon fully discharging a group of cells at 1400 amp. he obtained a capacity of 1580 amp.-hr. The supplementary discharge at the rate of 50 amp. until complete discharge at this intensity amounted to 1520 amp.-hr.—*Science Abstracts, Section B*, June, 1919. (Abstracted from *Elettricita*, Milan, Sept. 15, 1918.)

Units, Measurements and Instruments

Thermo-Electric Pyrometers for Plant Use.—A. O. ASEMAN.—The author offers curves showing the relation between millivolts developed and temperature for various thermocouples on the market. He also shows what protection must be given to the fire end of the thermocouple and various methods of keeping the cold junction at constant temperature. The suitability of various types of galvanometers for indication is also discussed by the writer.—*Chemical and Metallurgical Engineering*, July 15, 1919.

Telegraphy, Telephony and Signals

Direction Finding by Wireless.—The object of this article is to discuss the practical applications of the development of directional wireless telegraphy. It reviews briefly what has been accomplished during the war and indicates the probable lines of future development.—*London Times Engineering Supplement*, June, 1919.

The Oscillatory Valve Relay: A Thermionic Trigger Device.—L. B. TURNER.—In his introductory remarks the author distinguishes between relays and amplifiers. Various types of valve relays to acoustic frequencies for high-frequency signals and for wireless signals are described, and reference is also made to the use of the relay for steady or slowly varying current. Finally, an analysis is made of the sensibility and selectivity of the pre-tuned high-frequency valve relay, and the general limitations on sensitivity and speed of working are discussed.—London *Electrician*, July 4, 1919.

Maintaining Electric Oscillations by a Three-Electrode Lamp Valve.—C. GUTTON.—This question has been studied by the military radio-telegraph body, and a great number of army posts made use of these lamps to maintain waves. The sending distance is greater than without them, and the easy separation of messages makes possible a larger number of stations without causing confusion. The stations with tubes served well also for wireless telephony. This article deals with the theory of wave generators with lamps. Complete numerical control is not yet attained, but the formulas have none the less often been of great utility in satisfying conditions fixed in advance.—*Revue Générale de l'Electricité*, July 5, 1919.

Miscellaneous

Central-Station Rates in Theory and Practice.—H. E. EISENMENGER.—This is the first article of a series dealing with public utility rates in which the author defines a number of terms to be used in connection with the discussion of cost and then proceeds to outline a method of obtaining the cost of electric service.—*Electrical Review*, July 12, 1919.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

CHANGES IN NATIONAL ELECTRICAL SAFETY CODE

Bureau of Standards Issues Them in Tentative Form for Consideration by Conferees—No Radical Changes Involved

The Bureau of Standards has issued in tentative form the changes proposed for the third edition of part one of the National Electrical Safety Code. The changes have been submitted to the conferees for consideration and criticism. Dr. M. G. Lloyd, electrical engineer of the bureau, says that no radical changes are involved. The additions are aimed to make the rules more nearly complete.

NEW PLANT FOR HARTFORD MAY BURN OIL AS FUEL

Generating Station of 100,000 Kw. Rating to Be Built, and the Advisability of Using Oil Is Under Consideration

A new steam-turbine central station that will use oil as fuel is under consideration by the Hartford (Conn.) Electric Light Company for early construction on Colt's Meadows, Hartford, near the present Dutch Point station. Stone & Webster, Boston, have been commissioned to report upon the advisability of utilizing fuel oil on the scale demanded by the company's rapidly growing loads and to prepare general plans for the projected installation. The rating of the station will be about 100,000 kw.

PLANS SURVEY OF POWER SYSTEMS IN CALIFORNIA

Railroad Commission Taking Steps to Guard Against Possible Shortage This Fall and to Encourage Further Development of Resources

A survey of all power company properties in the state will be made by the California Railroad Commission. This is planned as a precaution against a shortage of hydroelectric energy in the next few months and to further greater development.

In announcing the intention to visit the properties members of the commission said in a letter to the companies:

The Railroad Commission has determined to make an investigation into the existing and proposed electric generating and transmission facilities of the power companies in northern and central California, with a view to ascertaining the needed improvements and additions to these facilities to relieve the growing shortage of power.

We are certain that you appreciate the critical situation of the power supply at this time and the urgent necessity of employing every practicable means to meet the increasing demand for power, both by new construction and by the reinforcement, where feasible, of present facilities. Now that the emergency created by the war is past, there ought to be a vigorous effort to accomplish this end. It is the purpose of this commission in this investigation to develop such facts as will be of help to all of the utilities interested, resulting ultimately in a program of necessary development.

It is the hope of the commission that an informal investigation will meet the needs of the situation, and such investigation will be so pursued unless developments indicate that formal proceedings are necessary to accomplish the desired purpose.

PACIFIC DIVISION JOBBERS' MEETING AT DEL MONTE, CAL.

Discussion Brings Out Opinion of Manufacturers that Labor Conditions and Buyers' Demands Will Sustain Price Level

The regular quarterly meeting of the Electrical Supply Jobbers' Association, Pacific Division, was held at Del Monte, Cal., on Aug. 20.

Discussion at the open session brought out the fact that manufacturers as a whole believe that labor conditions and the rapidly increasing demand for electrical devices will tend to sustain the present level of prices and will make prompt delivery difficult or impossible. The rapidly increasing power consumption per capita on the Pacific Coast was considered, as was also the unprecedented amount of hydroelectric development which is now under way there.

Immediately after the adjournment of the association, the advisory committee for the California electrical coöperative campaign held its regular monthly session.

"THAT'S THE TWENTY FIFTH HOUSE I'VE BEEN TO WHERE. EVERY DOOR TO THE CELLAR WAS LOCKED AND THE MAN OF THE HOUSE CARRYING THE KEYS IN HIS POCKET!
FOX

THE METERMAN IN A DRY LAND
—*From the Youngstown (Ohio) Telegram.*

ADVANCES IN THE PRICES ASKED FOR ELECTRIC RANGES

Hartford Company Suspends Sales Because It Considers Advances Excessive—Manufacturers Say that the Increase Was Necessary

In protest against the recent 25 per cent advance in the price of a number of prominent makes of electric ranges, the Hartford (Conn.) Electric Light Company has announced that as soon as it closes out its remaining stock it will discontinue the sale of electric ranges until it is convinced that fair prices have been established. The announcement, which caused something of a sensation in the New England electrical trade, was made in a local newspaper advertisement stating that the recent increase in prices appears unduly large to the company and that accordingly the company will not offer to its consumers an article that does not, in its opinion, represent a fair return for the amount of their investment.

A vigorous and successful campaign for the sale of electric ranges has been under way in Hartford this summer, and the Hartford company sold no less than 173 of these equipments in two months. With the exception of Boston, it is doubtful if there has been any city in New England where a greater interest in electric range service has been manifested of late, although a healthy activity in the sale of these products has been widely prevalent.

MR. HUGHES EXPLAINS INCREASED PRICES

"Any authorized committee of the National Electric Light Association, or any interested electric range customer or prospective customer, can gain access to our actual cost of producing and marketing ranges if he will only come to our plant and ask for it. Moreover, I think other manufacturers of electric ranges would be willing to extend a similar invitation to their trade. The range business has not been profitable to the manufacturers since war prices began to prevail. Actual analysis of cost showed real losses on every recent order. Such a condition, of course, could not go on longer. That and that alone is the reason why prices were advanced 25 per cent on July 23 and 10 per cent on Aug. 18, making a total average increase of only 76 per cent over pre-war prices."

This statement of George A. Hughes, president of the Edison Electric Appliance Company, Chicago, sums up the attitude of the electric range manufacturers toward criticism which has come from the trade because of the recent advances in range prices.

"All the information that we have been able to obtain from manufacturers and other sources on similar lines, such as gas and coal stoves," continued Mr. Hughes, "shows that prices have increased since the pre-war period approximately 100 per cent, which is an indication of the effect of present-day costs of material and labor.

"The present difficulty of the electric range manufacturers comes from the fact that range prices were not advanced from time to time during the war as were prices of other goods. Two years ago, when we were operating under the direction of the War Industries Board, the electric range business was practically at a standstill, and we should have put into effect at that time an increase in our selling values; but in view of the limited sales that we were making and the fact that, acting on instructions from the War Industries Board, we were not actively exploiting the sale of electric ranges, we did not do so.

"When the armistice was signed we, like all other manufacturers, assumed that there would be a large reduction in material and labor costs, but in this we were seriously disappointed.

"An analysis of the labor and material situation shows that the cost of material that goes into an electric range has increased 100 per cent and the cost of labor has increased approximately the same since 1916. In addition to this our labor is only about one-half as efficient as it was before the war.

"Before putting our increased prices on ranges into effect, we had a very careful analysis made of our cost, and on the most popular selling range in our line we were standing an actual loss of $32 per range."

WATER-POWER BILL IS AGAIN UP FOR ACTION

Sub-Committee Considers Amendments to Original Bill—Expectation Now Is that Final Consideration Will Not Be Long Delayed

The water-power bill (H. R. 3184), after lying dormant for about five weeks pending the return of Senator Jones, chairman of the commerce committee, from his Western trip, was again taken up this week for consideration.

The sub-committee of the original water-power committee had under consideration this week a number of amendments to the original bill. One of these provides that nothing in the bill should be construed to abridge the rights now granted by law to those seeking to use the public lands for purposes of irrigation or mining alone. Another amendment provides that the commission in granting licenses should give preference to applications by public service corporations already engaged in serving a municipality, state or the United States government, as well as to applications by states and municipalities.

Early in the week it was expected that the bill would be reported out Friday of this week, but it is not certain now when the bill will reach the Senate. Action, however, is expected within the near future, and those interested in the bill expect final consideration next week.

OVERHEAD SYSTEMS COMMITTEE PLANS MEETING IN CHICAGO

First Meeting to Be on Sept. 22 and 23, and Chairman W. K. Vanderpoel Asks Member Companies to Suggest Subjects for Action

The first meeting of the overhead systems committee of the Hydroelectric and Technical Section of the National Electric Light Association will be held in Chicago on Sept. 22 and 23. It is requested that member companies write to the chairman, W. K. Vanderpoel, 80 Park Place, Newark, N. J., suggesting any subjects which they think should be included in the program of the committee's work. The committee can then immediately study the line construction and maintenance problems which are most important and interesting to the member companies at this time as shown by the suggestions received.

N. E. L. A. MICHIGAN SECTION SEES BRIGHT OPPORTUNITY

Sixth Annual Convention at Ottawa Beach This Week Expresses Optimistic Tone, but Upkeep and Rates Are Considered Earnestly

Men who visualized the opportunities for service and for business building that confront central stations to-day were the principal speakers at the opening sessions of the sixth annual convention of the Michigan Section of the National Electric Light Association at Ottawa Beach on Tuesday, Wednesday and Thursday of this week.

This was the first central-station convention that has been held in Michigan since 1916, but the section has been well held together, as is evidenced by the fact that the registered attendance was about 125.

PRESIDENT CHANDLER OPTIMISTIC

The entire tone of the convention was optimistic. This note was sounded by President Thomas Chandler of Sault Ste. Marie, who in his address said in part:

"In changing from a war to a peace basis industry is forging ahead as never before. We are taking on new power and lighting loads as fast as we can build the extensions. Never in the history of the electric light business has there been a greater demand for house wiring and appliances in the home, such as washing machines, vacuum cleaners, irons, toasters, etc. The lack of housing facilities in most Michigan towns is universal. We have a heavy demand for residential extensions and should make the most of the opportunity.

"This is a progressive time, and if we are to fulfill our obligations to the public we must push ahead and supply the ever-growing demand for service. This requires much new financing.

"The cost of construction has nearly doubled; the cost of operating materials and labor has increased in great proportions; the cost of getting money has also increased. These costs can be met only in two ways, first by increasing economies in the service, and second by increase in rates. The economies of the service have already been developed to a most efficient state. In reality they can be expected to decrease slightly because of present high-strung times.

"The most important question before the public utility to-day is rates—meaning nothing more or less than getting a sufficient price for our commodity to allow us reasonable return on our money invested after properly keeping up our plant. In order to keep our industry in a good healthy condition we must give the class of service demanded and expected by the public. We must keep up our plant in a high state of efficiency and repair, charging off proper depreciation to take care of the wearing out of equipment and future replacements due to inadequacy and to betterments in the art, and we must earn a reasonable return on the investment. The failure in this is what has caused so many municipal plant failures.

"Many companies, because of the terrible increases in cost of coal and labor, have had to increase certain rates slightly. Others have hoped to effect unprecedented economies in the service and have not realized the seriousness of the situation, or have tried, because of public policy, not to increase rates, especially during the war. There are many companies which, because of past increases in economies of the service, have from time to time voluntarily reduced rates. These companies have had a certain pride and regretted any move toward increases. Still, all must meet the increased costs and bear the responsibility toward the public and toward capital. We must keep the property in a healthy condition, and we must expand for the needs of the public or disaster will ultimately follow. The matter of rates is certainly worthy of serious thought. The question of competent employees is also of continuously more importance."

In closing President Chandler also commented on the formation of the new Michigan Utilities Commission. As a means of stimulating association activity he suggested zoning the state and providing for more frequent meetings within these districts.

All of the papers presented were of a thoughtful, information-giving character. Discussions at some sessions where time was available for it was lively. John Swanson of the Consumers' Power Company, Jackson, in his paper on "Courtesy" gave a set of instructions which any manager might well use in introducing a new clerk or other employee to his job of meeting and handling the public. "Electrical Merchandising," by A. H. Touscany, Detroit Edison Company, had an argument for the more conservative appliance sales methods as opposed to the intensive campaigning methods. Discussion of this paper showed that few of the central-station men believed in what might be termed the dignified, non-aggressive policy. They preferred to hire specialists to solicit forcefully.

The keynote of a paper on the central station and the contractor-dealer by R. A. Gordon of the Houghton County Electric Light Company, Houghton, Mich., was ably stated in his own words: "It will be a great day for all when, instead of meeting solely as the Michigan Section of the N. E. L. A., we meet as an intensively organized industry with sub-sections devoted to the individual interests of the central station, the contractor, the contractor-dealer, the manufacturer and the jobber, respectively, all working together harmoniously for the advancement of our industry as a whole."

MANY TOPICS DISCUSSED

At the evening session on the first day W. A. Durgin, Chicago, delivered an illustrated address on industrial lighting. He was followed by J. F. Mayo, Consumers' Power Company, Jackson, who suggested that the Michigan association appoint an illuminating committee to assist member companies in capitalizing on the present opportunities for selling better lighting. H. J. Burton, Consumers' Power Company, Jackson, in his paper on "Working Safely on High-Tension Lines," discussed practical safety methods and appliances now successfully used by transmission and distribution companies. Robert Davey of Jackson described the system of plant investment accounting used by the Consumers' power houses. J. V. Oxtoby, a lawyer from Detroit, explained the important phases of Michigan's new public utility law. A particularly instructive talk by F. A. Newton of Jackson brought out the value of analyzing data on earnings as well as data on expenses.

All of the above-mentioned addresses were presented at the sessions of the first two days' meetings. Others prepared for the last day, a report of which will appear in next week's issue, included one on electric ranges by R. F. Hotton, Detroit, and one on electrical merchandising by H. H. Koehlbel, Muskegon.

JOHN A. BRITTON TO N. E. L. A. PUBLIC POLICY COMMITTEE

Chairman Writes to Members Discussing Policies of the Coming Year—"We of the West Want the East to Know Us Better"

John A. Britton, Pacific Gas & Electric Company, San Francisco, the newly appointed chairman of the public policy committee of the National Electric Light Association, has written a letter to members of the committee discussing the problems which are before the industry. Mr. Britton expresses the great need that the industry should stand together at this juncture. His letter in full follows:

"As chairman of the public policy committee of the National Electric Light Association I wish to discuss with the members of that committee the policies deemed essential by me to be pursued during the coming year.

"First and foremost, I am in sympathy with and ready to stand back of all the plans which have been suggested by President Ballard, and pledge myself to support him in his more than laudable effort to make his administration year a record one for the association. I hope that the members of our committee will assist Mr. Ballard in securing men of prominence in the industry for chairmen and members of several new general committees which he is trying to organize to work out the big problems now confronting us. These will require the thought of some of the best minds and work of the best men.

"We of the West want the East to know us better. We want to expand the usefulness of the association. We want it to be nation-wide in its influence. It can be of the greatest good.

"The fundamental policies which must govern the attitude of public utilities should be alike. In my judgment this can best be accomplished through the suggestions made by our president, particularly with reference to the formation of geographic sections.

"The methods of approach to the rate-regulating bodies must be upon sound principles of equity. Individual opinions enforced through argument in special cases should not be permitted to raise questions inimical to the public utilites as a whole. The East has never been appreciative of the necessities of water-power development. It has been more or less inactive in support of Western needs and conditions. This condition must be remedied.

"Standards must not be encouraged in sections of the country that might be detrimental to other sections. In this connection action is necessary.

"The public policy committee should be a judicial body acting upon the general questions raised in the association and coming through the avenues of the different committees. For that reason it should be clearly in touch with the action of all committees, but more especially the executive committee, and should have intimate knowledge of what is being discussed and of the problems that concern each of the subdivisions of the organization. I have arranged with the president that copies of the minutes of the executive committee meetings shall be sent to each member of the public policy committee.

"If ever there was a time in the history of our association when to overcome the insidious working of antagonistic interests we should stand together, that time has now arrived. National legislation and state legislation should be correlated with the needs of all states, so as not to form dangerous precedents. Matters of this kind can best be worked out through the agency of such a committee as the public policy committee.

"I want each and all of you to pledge yourselves to a shoulder-to-shoulder campaign with our president. Like the West from which he comes, he is progressive, ambitious and resourceful. I am sending a copy of this letter to you and to each of the vice-presidents and invite from you and them such suggestions of matters to be considered at the meeting of the public policy committee to be held in September as may occur to you as being things that could receive consideration at the hands of that committee in line with the policies which I have outlined in the preceding paragraphs."

CALIFORNIA CITIES EAGER FOR 1920 N. E. L. A. CONVENTION

President Ballard Will Present Claims of the Different Southern California Cities to the Executive Committee at September Meeting

Already there is an interesting rivalry among the cities of southern California for the honor of being selected as the place of holding the 1920 convention of the National Electric Light Association. President R. H. Ballard is in receipt of a number of invitations which he will submit to the executive committee at its meeting in September, at which time the place of meeting will probably be settled.

Los Angeles, the metropolis of the Southwest, with a national reputation as a convention city and noted for the hospitality it extends to those who visit it as representatives of important organizations, is eager to secure the convention. Its magnificent hotel accommodations, its central location, its proximity to the chain of beach resorts and its wonderful roadways and interurban electric lines, radiating in all directions, have much to commend it.

Pasadena, the Crown City of the San Gabriel valley, under the shadow of Mount Wilson and in the center of some of the most beautiful scenery in southern California, and only 9 miles from Los Angeles, would be an ideal place for the session.

Riverside, in the center of the great orange and lemon belt with superb scenery on every hand and close to some of the great hydroelectric plants, desires to be considered.

San Diego, on one of the most remarkable natural harbors in the world, with magnificent hotels and all the attractions that Eastern visitors enjoy, has presented its claims.

Santa Barbara, the romantic and historic city by the sea, with its lore of other days, its wonderful old mission, some of the best hotels in the West and excellent facilities for entertaining, has also put in a request for the coveted honor.

President Ballard says that he will try to present all of these requests to the executive committee in as impartial a manner as possible, requesting the members to make the selection. He feels that those who reside in other sections of the country should be best qualified to choose the place that would best suit the visitors to southern California.

MANY MATTERS BEFORE THE N. E. L. A. EXECUTIVE COMMITTEE

Chairmen of Various Sections Report Progress in Organization and Plans for Active Work During the Coming Year

Many matters were considered at the meeting of the executive committee of the National Electric Light Association at the New York headquarters on Aug. 14

In the absence of President Ballard, Vice-president Martin J. Insull presided.

In connection with a discussion concerning the necessary reprinting of the "Salesman's Handbook" and the "Overhead-Line Construction Handbook," the general question of the method of distribution of these and other handbooks to the membership was brought up and was referred to a special committee, which will report at the next meeting of the executive committee. John G. Learned was appointed chairman of this committee, of which the other members are the treasurer and the chairmen of the membership and company sections committees and the chairmen of all national sections issuing handbooks.

Chairman J. W. Perry presented the report of the exhibition committee, reviewing the work done in advance of the convention scheduled for Atlantic City in 1918 and the work accomplished this year. He reported that the prizes of $150, $100 and $50 for the best papers describing the exhibit as a whole had been awarded. There were eighty-five exhibitors this year, the largest from the standpoint of number and square feet of space in the history of the association, and twenty-five exhibitors had to be refused on account of their late applications. Mr. Perry reported the following officers and members of the executive committee elected for the year 1919-1920: C. L. Peirce, Jr., chairman; F. H. Gale, treasurer; H. G. McConnaughy, secretary; members of executive committee for one year, J. C. McQuiston, George A. Hughes, G. A. Freeman; for two years, C. L. Peirce, Jr., S. E. Doane, Frank H. Gale; for three years, Charles Blizard, John Mustard, J. W. Perry.

Mr. Insull read a letter from E. W. Lloyd stating that the committee on insurance matters appointed at the last executive committee meeting felt that the interests of the N. E. L. A. with regard to insurance questions—such as the relative rating of electrical apparatus and other properties, and keeping in touch with the laws of the different states as to the possible liabilities of central-station companies as to fires and accidents caused by wiring beyond their control (or within their control), etc.—should be under the control of the association working through a committee composed of members of the Technical and Commercial Sections.

J. F. GILCHRIST HEADS PUBLICITY COMMITTEE

Vice-president Insull reported that John F. Gilchrist had accepted appointment by President Ballard as chairman of the publicity committee, and Mr. Insull read a letter from Mr. Gilchrist outlining his plans. These plans provide for the establishment in each state of a committee similar to that already organized in Illinois. These committees will finance themselves and will furnish news bulletins to their members. The chairmen of the state committees will form the personnel of Mr. Gilchrist's main committee. Mr. Gilchrist felt that it would be desirable to include the railway, gas and telephone people, and that this would probably mean that in some cases the chairmen of the state committees would not be electrical men, but he did not feel there was any objection to this.

PLANS OF PRESIDENT BALLARD

Mr. Insull also read a letter from President Ballard outlining his plans for his September trip East, stating that he planned to call a meeting of the executive committee during his visit in New York and suggesting the advisability of holding a national conference at that time and also a meeting of the public policy committee. The question of a conference was discussed, and it was felt that this should be held under the direction of the public policy committee.

Vice-president Frank W. Smith reported that he had asked Arthur Williams to serve as chairman of the bulletin committee and that it was hoped that he would accept this appointment, which was confirmed by the executive committee.

Mr. Insull reported that John F. Gilchrist and John G. Learned had represented the association at the convention of the National Association of Electrical Contractors and Dealers in Milwaukee in July. The principal subject discussed was a plan for educating the small dealers and contractors in selling appliances. The manufacturers agreed to raise a certain sum provided the other interests would recommend the plan. Mr. Gilchrist had advised Mr. Insull that he agreed to recommend to the N. E. L. A. that its members indorse the plan, but he felt that no steps should be taken until the arrangements had been worked out more in detail.

J. C. Van Duyne, vice-chairman of the Accounting Section, reported that all the section committees are actively at work and section affairs progressing.

Chairman George B. Foster of the Electric Vehicle Section reported progress and stated that all of the committees are actively at work, with the exception of the insurance committee, whose work will be held in abeyance until a decision has been reached by the national executive committee in connection with the suggestion of Mr. Lloyd's committee that a general committee on insurance be appointed.

Chairman Foster also reported that it had been brought to his attention that the municipal authorities of New York City were investigating the broad subject of harbor, steamship and railroad terminal facilities, including the transportation of freight over the city streets to such terminals and the handling of materials in the terminals. As the street transportation phase of this investigation is closely associated with the electric vehicle, Mr. Foster thought that efforts should be made to bring to the attention of the commission investigating this matter the merits of electric transportation. While this, of course, is purely a local situation, the recognition of the electric vehicle in solving this problem is of national importance, and therefore the coöperation of every one concerned, particularly the central-station interests in and about New York City, is very essential.

For the Commercial Section Chairman Learned reported that a two-day meeting had been held at Association Island the first week in August, when the bureaus and committees were appointed.

A discussion followed as to continuing to limit the sale of handbooks, the Commercial Section booklets and the educational courses solely to the membership, and the matter was referred to the public policy committee.

LARGE PLANS FOR N. E. L. A. COMMERCIAL SECTION WORK

Executive Committee Approves Arrangements for Enlargement and Development of Commercial Activities in Coming Year

As stated previously in the ELECTRICAL WORLD, a meeting of the executive committee of the Commercial Section of the National Electric Light Association was held at Association Island, N. Y., on Aug. 7 and 8. A fuller account of the proceedings of this organization meeting is now available, and it shows that comprehensive plans are well advanced for active promotion of Commercial Section work in the coming year.

At the first session on Aug. 7 Chairman John G. Learned submitted a list of bureaus and committees, together with respective chairmen selected, as follows:

Bureaus.—Advertising and publicity service bureau, L. D. Gibbs (Boston), chairman; lighting sales bureau, Clarence L. Law (New York), chairman; merchandise sales bureau, E. A. Edkins (Chicago), chairman; power sales bureau, R. H. Knowlton (Philadelphia), chairman.

Committees.—Commercial service and relations with customers committee, R. F. Bonsall (Baltimore), chairman; committee on education, Fred R. Jenkins (Chicago), chairman; committee on relations with contractors, dealers and jobbers, M. S. Seelman (Brooklyn), chairman; committee on compensation of selesmen, Adolph Hertz (New York), chairman; "Electrical Salesman's Handbook" committee, I. Lundgaard (Rochester), chairman; finance committee, M. S. Seelman (Brooklyn), chairman; committee on the sale of company securities to customers and resident citizens, A. F. Hockenbeamer (San Francisco), chairman; wiring committee, R. S. Hale (Boston), chairman.

The resignation of W. H. Hodge as a member of the executive committee was presented and accepted with regret. Chairman Learned appointed a nominating committee, consisting of L. D. Gibbs, chairman; E. A. Edkins and R. H. Tillman, to make recommendations as to Mr. Hodge's successor.

ORGANIZATION OF LIGHTING SALES BUREAU

In reporting for the lighting sales bureau, Chairman Law called attention to the accompanying chart, which shows the organization under which it is proposed to operate the bureau during the present year. In speaking of the chart Mr. Law said:

> The executive committee will be represented on other bureaus of the Commercial Section, such as the wiring committee, "Electrical Salesman's Handbook" committee, committee on education, etc.
>
> The National Association of Electrical Contractors and Dealers and the National Council of Lighting Fixture Manufacturers will also be asked to affiliate with the work of the lighting sales bureau by appointing representatives of their associations on the executive committee.
>
> Through this organization it is proposed to keep closely in touch with all commercial subjects having reference to work of lighting sales.
>
> The activities of the lighting sales bureau will be substantially the same as in the past, with the addition, however, of activities necessary in coöperating with the various geographic sections, the company sections and associations which will be affiliated with the bureau because of their relation to the general subject of lighting and its commercial aspects.

In the discussion attending the organization of the lighting sales bureau the relationship of the bureau to the geographic sections of the N. E. L. A. was emphasized, and it was the consensus of opinion that the organization plan evolved by Mr. Law would effectively connect the Commercial Section with the geographic sections, state organizations and company sections. It was also the consensus of opinion that similar organization should obtain with all other bureaus and, to the extent practicable, with the committees of the Commercial Section.

Consideration was then given to the matter of meetings of bureaus and committees and the executive committee of the section during the administrative year. It was deemed desirable to schedule such meetings through A. Jackson Marshall, the executive representative at headquarters, to the end that meetings could be so timed as to exact a minimum amount of traveling on the part of members. It was also deemed desirable, when practicable, to hold two or more meetings of bureaus and committees at approximately the same time and place, especially where there exist interlocking membership representations. Another plan favored was to hold meetings of the bureaus and committees prior to meetings of the section's executive committee, so that chairmen of bureaus and committees could report to the executive committee, and that such section executive committee meetings be held prior to meetings of the national executive committee.

SCOPE OF POWER SALES BUREAU WORK

Chairman Knowlton of the power sales bureau made preliminary recommendations regarding divisional organization as follows: (1) General power; (2) industrial electric heating; (3) electrochemical; (4) isolated plant; (5) electric steel furnace; (6) current rate practices; (7) special addresses for convention; (8) geographic sections.

Chairman Edkins of the merchandise sales bureau reported that his bureau was to be organized along two lines, one dealing with "research," the other with "service," indicating that in his judgment the most important work which the bureau could undertake would be a thorough investigation as to the best methods of organizing merchandising activities, including how to improve present methods and how to secure more business. Mr. Edkins presented a tentative divisional organization outline of the merchandise sales bureau as follows: (1) Household electric ranges; (2) electrically equipped furniture; (3) electric shop merchandise; (4) merchandising service to central stations; (5) merchandising statistics and economics; (6) standardization and national testing.

Some or all of these divisions will be further subdivided into groups. Mr. Edkins also spoke of the desirability of representation of his bureau on the advertising and publicity service bureau, the lighting sales bureau and the power sales bureau, and any committee whose work may in any way be related to the development and sale of electric shop merchandise, including the "Electrical Salesman's Handbook" committee.

Chairman Gibbs of the advertising and publicity service bureau suggested that the bureau's work this year should be considerably broadened to the end that advertising and publicity service could be rendered the electrical industry, and that it should be the function of the bureau to impart information pertaining to Commercial Section activities to all branches of the industry and obtain the coöperation of all concerned. Mr. Gibbs recommended that the bureau be organized with two divisions and four groups—First, a publication division (a successor to the publications committee),

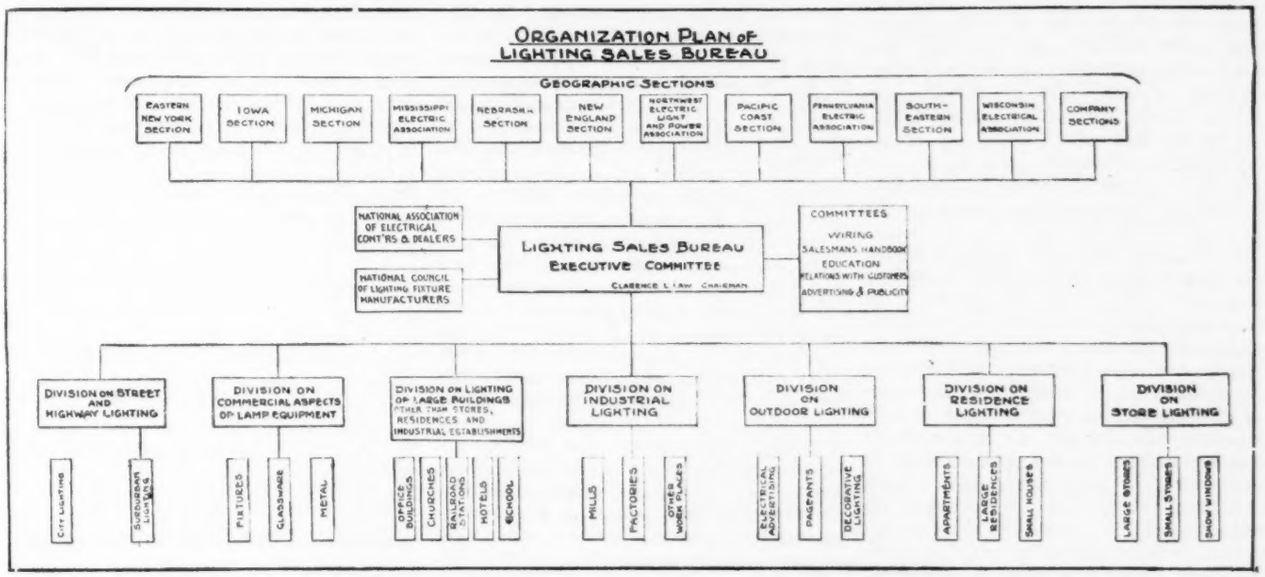
which would have charge of all booklets, circulars, etc., and second, a general advertising division with four groups as follows:

(a) Coördinate advertising and sales campaign work (successor to the committee on coördinate advertising and sales campaign); (b) illuminating engineering, cooperating with the Illuminating Engineering Society, lighting sales bureau and other related activities; (c) coöperation with manufacturers of nationally advertised commodities; (d) more service outlets, a development which Mr. Gibbs pointed out was of paramount importance.

Mr. Gibbs indicated his desire of including in the personnel of his bureau at least one member from each state and liberal cross-membership with bureaus and series of monographs, each of which would treat of some major subject of particular interest to the central-station industry. Mr. Lundgaard also thought that monographs of this character, in addition to being placed in the hands of class B and E members, could be distributed through the advertising and publicity service bureau to central stations for local distribution to individuals and concerns interested. The consensus of opinion favored the development of small bound volumes covering grouped subjects.

EDUCATION OF SALESMEN

Chairman Jenkins of the committee on education of salesmen said that the personnel of the committee consisted at present of twenty-nine representatives in the



COMPREHENSIVE ORGANIZATION OF THE LIGHTING SALES BUREAU

committees of the Commercial Section, pointing out that the bureau would consist of at least 100 members, and that there would be a systematic tie-in with geographic and company section organizations.

MR. HALE REPORTS ON WIRING

Chairman Hale of the wiring committee made an extended report. Mr. Hale recommended that the committee be permitted to prepare a lecture treating of wiring methods for the benefit of the contractors, etc., and announced that a sub-committee had been appointed to prepare a table of contents on the subjects which such lecture should cover. Mr. Hale also stated that it seemed desirable to prepare a lecture on wiring methods for the benefit of the householder, and that a subcommittee had been appointed to suggest a synopsis for this.

Mr. Hale reported on the results of tests which the committee is conducting in the matter of wiring, which it is calculated will continue for a number of years with a view to ascertaining the behavior of different kinds of wire when employed under different conditions in actual practice.

Chairman Lundgaard of the "Electrical Salesman's Handbook" committee reported that the supply of handbooks was entirely exhausted and it would therefore be necessary to consider the publication of a new edition. He advanced the possibility of developing a United States and two Canadian representatives, and that he would attempt to organize his committee further along the general lines employed by the lighting sales bureau. Mr. Jenkins emphasized the importance of educational courses, particularly at this time when central-station companies are rehabilitating their forces, depleted on account of the war, and asked the earnest coöperation of central-station commercial managers in this work, which would be emphasized this fall by an advertising campaign likely to cause increased enrollment.

Chairman Seelman of the committee on relations with contractors, dealers and jobbers said that as this committee had been decided upon but recently there had not been sufficient time to suggest personnel and to define its scope of activities. Mr. Seelman pointed out the desirability of close coöperation with other branches of the electrical industry, and suggested that the personnel of the committee might be formed of representatives of the jobbers' association, contractor-dealers' association, manufacturers' associations and the National Electric Light Association.

The nominating committee appointed to recommend a successor to Mr. Hodge reported that the unanimous choice was L. A. McArthur, general manager of the Pacific Light & Power Company, Portland, Ore., and Mr. McArthur was thereupon elected to fill the vacancy in the executive committee.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Jurisdiction Over Company Selling Water for Power.—A decision of the Illinois Public Utilities Commission, affecting the Marseilles Land & Water Company, dismissed a complaint against that corporation on the ground that it is not a public utility. The commission held that a company which operates a dam and sells water to several users for the creation of water power, but which does not create any electric or water power of its own and has no machinery or waterwheels for that purpose, and does not own the land on which the water is converted into electrical energy, and has transferred the only contract for rendering electric service which it possessed to another company, is not a public utility within the meaning of the law. The fact that a company owns a franchise by authority of which it has constructed a dam across a river and is charging tolls for the use of the water does not in itself make such company a public utility when the company should have the right to construct such dam and make use of the water power thereby created irrespective of any grant from the state. The fact that a dam company selling water for use to create water power sells to a public utility does not in itself make the dam company a public utility. A company which has constructed a dam across a river and sells water to several users for the creation of water power, but which creates no water power itself, has not devoted its property to a public use within the meaning of that term as construed by the Supreme Court of Illinois. The fact that the act of incorporation of a company purports to confer the power of eminent domain upon it does not, in the absence of a showing that such power was ever exercised, render such company a public utility.

Transmission Line Damage to Telephone System.—The Missouri Public Service Commission after a complaint by the Meissner Telephone Company against the Union Electric Light & Power Company of St. Louis, alleging damages due to the construction of a high-voltage transmission line, was asked by the two parties to act as arbitrator. It did so and held that the telephone company was entitled to relief in the sum of $8,000. The commission decided that the transmission line caused interference by induction to such an extent and of such a character as to render the telephone lines incapable of efficient and satisfactory commercial use. In deciding the liability of the electric company it was guided by the rulings of the Iowa Board of Railroad Commissioners, which issued a study on electrical interference on Dec. 30, 1916, supplemented by a modification on Nov. 3, 1917. The commission says in part: "The rule contended for, that the electric company has the right to make whatever use it chooses of its transmission line and is liable to the telephone company only in so far as that use is negligent, is limited by the further rule that it is the duty of every one to use his property in such manner as not to cause injury to adjoining owners. This limitation has been frequently applied to such occupations as smelters fertilizing plants and the like, where the exercise of the highest degree of care in operation will not avoid injury to others. The law books contain many cases where the courts have applied this rule. The uncontrollable inductive interference incident to the careful operation of a high-voltage electric transmission line should and does bring the electric company within limitations of this same wise and salutary rule. The difficult question confronting us is the character and extent of the relief to be provided for the telephone company. To permit the operation of the transmission line without providing any adequate relief amounts to practical confiscation of the property of the telephone company without compensation and destruction of the service to which its subscribers are entitled. It would be unfair to throw on the telephone company the burden of making its system metallic when that character of construction is not required by the present or immediate future needs of its subscribers and the territory it serves. In either case the cost of the change must be borne by one set of consumers or the other. The priority of the telephone company in the territory determines the question for us. . . . The cost of making the changes exceeds the damages the telephone company should be paid. At least a portion of the cost of making the telephone lines metallic will be absorbed in correcting certain deficiencies of the present line as a grounded telephone system. It would be manifestly unfair to charge such work to the electric company. Also when the work is completed the telephone company will have a property greatly enhanced in value. It will be freed from the necessity of making its lines metallic, which it might be compelled to finance at some time in the future, owing to the progress of the art of telephony and the later needs of its subscribers, even had the electric company not built its transmission line. Those considerations have a real value, although it is difficult of exact calculation. We feel that we are justified under the submission agreement and the equities of the situation in fixing that value to the telephone company, and by that amount reducing the amount of the cost of making necessary changes to be assessed against and to be paid by the electric company. Taking all these matters into consideration, it is our opinion that the electric company should pay to the telephone company as damages the sum of $8,000. In addition the electric company should bear the cost of making all transpositions in its transmission line rendered necessary by the building of metallic telephone line by the telephone company. It is expected that the telephone company will immediately take the necessary steps to make its system metallic and remove its lines from danger of physical contact with the transmission line. This report indicates the character and extent of the changes which should be made in the telephone lines. The application of the money received by the telephone company under the award in this case is not deemed a matter for consideration and determination herein. The service of the telephone company it a matter for inquiry and regulation under the general powers of the commission, and under such powers the commission can require the necessary expenditures to be made if the telephone company does not wisely apply the award."

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

International Brotherhood of Electrical Workers.—This organization will hold a convention at New Orleans, La., from Sept. 15 to Oct. 1.

Patent Evils to Be Discussed by Chemical Society.—The question of patent reform will be discussed by the American Chemical Society in a special symposium at its annual meeting in Philadelphia from Nov. 2 to 6.

New York Electrical League Holds Outing.—Tauer's Inn, City Island, N. Y., on Aug. 19 was the scene of an outing held by the New York Electrical League and attended by more than 200 persons representing all branches of the electrical industry and including some visitors from the Middle West and Pittsburgh. Features of the evening's entertainment included an auto bus ride to the inn and a shore dinner.

A. I. E. E., Panama Section.—The July meeting of this section of the American Institute of Electrical Engineers took the form of an inspection trip aboard the U. S. superdreadnought New Mexico, anchored in the Bay of Panama. Commander P. L. Carroll personally conducted the visiting party around the ship, explaining in detail its unusual method of control. T. C. Morris conducted the section through the new cold-storage and ice-manufacturing plant situated at Mount Hope, Canal Zone, at the August meeting.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Central-Station Rates in Illinois.—The Public Utilities Commission of Illinois has recently entered a number of orders continuing in effect the increased rates for electric service in various cities and towns which it had authorized during the year 1918. In the majority of cases these increased rates are made effective by the present order until the fall of 1919.

Daylight Saving Through Local Action.—The National Daylight Saving Association decided at a meeting in New York on Aug. 22 to start a campaign to induce individual municipalities and states to establish the hours which Congress has declined to require as a national measure. Marcus M. Marks, president of the association, feels that 90 per cent of the people of the country favor daylight saving and that local action will be taken to make daylight saving operative.

Asks Engineering Representation on Interstate Commerce Commission.—J. Parke Channing, president of the Engineering Council, has written to President Wilson requesting that in filling the vacancy the Chief Executive will "give earnest thought to the selection of a man who to his other qualifications adds the training and experience of an engineer familiar with transportation problems. . . . The engineer's training fits him for that mode of thinking which is indispensable to impartiality of judgment. One important function of the commission is valuation of public utilities and another is the determination of relationship and responsibilities of the management of such utilities to the public. No other body of men has given so extensive and so scientific consideration to these matters as have members of the engineering profession."

War Load in New Jersey.—President Thomas N. McCarter of the Public Service Corporation of New Jersey said in his annual report to stockholders for 1918 that the excessive loading of the generating plants and systems as a whole continued up to the time of the signing of the armistice, and while the safe all-day rating of the 60-cycle system in the northern zone was 100,000 kw., at times the load was as high as 109,000 kw. In the southern zone the safe all-day rating was 18,000 kw., but at times the demand was as high as 22,000 kw. The war industries did not lessen their activities immediately following the signing of the armistice, and the load was not affected from this cause during the rest of the year. There has, however, been some curtailment of load since the close of 1918. The company continued its policy of supplying power to large customers at transmission voltage, some of the larger installations being to army or navy stations direct or to concerns engaged in war work. Practically 90 per cent of the company's connected commercial power load, it is estimated, was utilized during the year, either directly or indirectly, for undertakings associated with the prosecution of the war.

Electrical Exposition Will Reopen Grand Central Palace.—Grand Central Palace, New York City's largest exhibition building, which during the war was an army hospital, is about to resume its normal peace-time status. Its return to the field of industrial exhibitions will be signalized on Sept. 24 next, when the Electrical Exposition opens there for ten days. With the exception of last year this exposition has been held annually in New York since 1907. Workmen are now restoring the exhibition floors of Grand Central Palace to their original state. One hospital feature will remain as a part of the Electrical Exposition. This will be an electro-therapeutic exhibit by the medical department of the United States Army. It will serve to train doctors in the many new uses of electricity in the therapeutic field and to enlighten the public on their benefits. This year's show will be especially varied and interesting because it will disclose high-tension developments in the electrical field for two full years.

Business Conference in Chicago.—Vital problems of business, multiplied by post-war and industrial developments, will be discussed at a national conference to be held in Chicago Sept. 8 and 9, under the auspices of the Illinois Manufacturers' Association. The sessions will be at the Congress Hotel. Trade and industrial associations in every line have been invited to appoint delegates. Representation is to be given at the conference not only to business but to the farming interests. Leaders of organized labor have also been invited to talk and to state where the demands of workers are going to stop. Some of the subjects which it has been suggested be discussed at the conference are the following: Participation in private business on the part of the federal government, nationalization of industry, influence of exports on prices and production, possibilities of increasing production, the relation of the United States to the rehabilitation of industry in Europe, stabilization and guarantee of contracts, definition of profiteering, the attitude of employing farmers and manufacturers to labor, adjustment between property rights and community interests, participation of labor in the management of industry, increasing the purchasing power of the dollar, distribution of war debt, governmental price fixing, the Plumb plan, and the solidarity of farming and business interests.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Revocation of Franchises.—The Supreme Court of Appeals of Virginia has held that where the state constitution gave municipalities irrevocable power to fix by franchise contract the rates to be charged by quasi public corporations, as electric light companies, the state has the power to revoke the authority granted, but such revocation can affect only the validity of future actions of municipalities and does not affect a franchise contract already made (Virginia-Western Power Company vs. City of Clifton Forge, 99 S. E. 723).

Evidence in Tampering with Meters.—In a prosecution for tampering with or changing electric meters (Rugg vs. State, 210 S. W. 630) before they could be tested by assistant state sealer of weights and measures, in violation of the Acts of 1913, Chapter 46, Section 9, evidence of the assistant sealer and superintendent of weights and measures that the meters had been tampered with or changed by defendant before they could be tested, where such facts were not of his own knowledge but merely from information, was insufficient to sustain conviction.

Joint Contract for Extending Electric Line.—Under contract whereby defendant agreed to extend his transmission line to furnish plaintiffs electric energy, and they severally promised each to pay him $250 therefor, and he promised to charge any other person $250 for connecting with the extended line, and to divide half of it between them, his promise to divide, though joint in form, is several in essence, giving rise to separate causes of action, in view of the several promises, according to the Supreme Court of Vermont (107 A. 116).

Validity of Statute Creating Board of Public Utilities.—The Supreme Court of Louisiana has pointed out (82 S. 280) that act No. 36 of 1916, creating the board of public utilities for the city of New Orleans, contravenes the constitution, 1913, Article 319, because it does not provide for the election of the members of such board by the people of New Orleans or council thereof, or their appointment by the Mayor, such article of the constitution giving to the city of New Orleans the right to select the officers who shall exercise police power therein, or who may be charged with the administration of any part of its affairs, except where the matter is controlled by other provisions of the constitution which have to be so construed in order to give effect to all.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

V. M. Johnson, auditor of the Grand Island (Neb.) Power Company, a subsidiary of the Middle West Utilities Company, has been elected president of the local N. E. L. A. section recently organized.

John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company of San Francisco, who has recently been appointed chairman of the N. E. L. A. public policy committee, besides being an influential factor in association work on the Pacific Coast for a number of years, is well known throughout this country as a central-station engineer-executive. Although born in the East in 1855, Mr. Britton, since he was nineteen years of age, has been identified with the building of Pacific Coast utilities. As first

JOHN A. BRITTON

vice-president and general manager of the Pacific Gas & Electric Company, he directs the affairs of the largest generating and transmission system in the world. Mr. Britton has been an enthusiastic supporter of all electrical activities on the Coast and educational work as well. In 1915 he was chairman of the general convention committee of the N. E. L. A. in charge of the meeting held in San Francisco that year and also director of the Panama-Pacific International Exposition Company. For many years he has been a member of the board of regents of the University of California under appointment by the Governor of the state. He is a member of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Gas Institute and many Pacific Coast organizations.

Montford Morrison, consulting electrical engineer for the Victor Electric Corporation at Chicago, was recently appointed a member of a special technical jury to investigate the dirigible balloon disaster in that city. During the war Mr. Morrison has done considerable noteworthy work in the development of special electrical equipment, particularly in the design of X-ray outfits for use by the American and allied armies on the battlefields of France.

H. N. Wood has been appointed power sales manager of the Mahoning & Shenango Railway & Light Company at Youngstown, Ohio, succeeding C. I. Cripper. Mr. Wood has returned to the company from United States government service.

Charles W. McKay has recently taken charge of the appraisal division of L. V. Estes, Incorporated, of Chicago. He will specialize in the appraisal of industrial properties for federal income-tax purposes and of public utility properties in connection with rate cases. Mr. McKay is the author of "Valuing Industrial Properties," published in 1918, and of "Telephone Rates and Values," now in press. He has also contributed numerous articles to technical journals on valuation subjects. He is a member of the advisory council of the Industrial Extension Institute.

A. S. Witmer, who for the last eight years has served as industrial engineer for the Louisville (Ky.) Gas & Electric Company, has been elected secretary and general manager of the Louisville Industrial Foundation. This foundation was organized in 1916 for the purpose of controlling a million-dollar factory fund which was raised at that time for the industrial development of Louisville. Mr. Witmer has had four teen years' experience as an industrial engineer with several of the larger power companies and has gained familiarity with factory conditions and problems which will be of value in his new connections. He has been active in National Electric Light Association work and is vice-president of the Louisville Jovian League.

E. P. Peck, recently appointed general superintendent of the electrical department of the Utica (N. Y.) Gas & Electric Company, is a native of the South, where he is well known in electrical circles on account of original investigations and development work conducted as a member of the engineering staff of the Georgia Railway & Power Company for more than thirteen years. Mr. Peck was born in Atlanta, Ga., Aug. 13, 1882, and attended the Georgia School of Technology, leaving in 1903 to take up practical work. For two years he was connected with electrical construction, maintenance and repair work in Northern cities. In 1905 he returned to Atlanta and was employed by the Georgia Railway & Electric Company in its repair and meter shops. One year later he was made foreman of the company's testing department. This position he held until 1912, when he was promoted to assistant electrical engineer in charge of electrical station layouts and construction and of testing. In 1917 he was again advanced to superintendent of operation, which position he held until October, 1918, when he resigned to take up war work in Washington, D. C. Mr. Peck's operating experience covers a wide range of station electrical construction, operation and maintenance, rehabilitation of overhead and underground distribution systems, design and investigation problems in connection with high-voltage transmission-line construction, building and operation of outdoor substations, apparatus develop-

E. P. PECK

ments, resulting in the creation of new and improved designs of stations, transmission-line and laboratory equipment, in addition to the organization of an extensive testing department and maintenance of a large modern laboratory. In all this work Mr. Peck has successfully combined technical knowledge with organizing ability.

Obituary

Alva S. Chisholm, assistant to the president of the American Steel & Wire Company, died in Cleveland Aug. 21, at the age of forty-eight. He was the son of William Chisholm, one of the pioneers of the steel and wire industry.

Frank W. Townsend, for thirteen years chief engineer of the power plants of the Narragansett Electric Lighting Company, Providence, R. I., died at Saranac Lake, N. Y., Aug. 17, after a lingering illness. He had been there for his health for about a year. Mr. Townsend was forty-five years old. Before joining the Narragansett Electric Lighting Company he was connected with the Clyde Steamship Line and other steamboat companies operating on the Atlantic.

TRADE & MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies— Notes on Industrial Activities and Business Methods

LABOR UNREST IS HAVING AN EFFECT ON ELECTRICAL TRADE

Deliveries Lengthening So that It Would Not Be Unwise Where Possible to Accumulate Substantial Stocks in Building Lines

Increasing uneasiness of labor is having its effect on the electrical trade, all of which is proving to be cumulative. A railroad strike in New England, a walkout of brass and copper operatives, a shutdown of some wire mills—all tend to lengthen deliveries. These, taken on top of a large consumer demand, a shortage in freight facilities and local labor troubles, are preventing the trade from doing a larger business.

With this condition to-day the industry is faced with the prospect of a railroad strike early next month and a strike in the iron and steel field. Should this latter strike come about with a large percentage of operatives out, the visible supply of conduit would quickly vanish. Already the demand is large and growing, and local stocks are only fair.

Jobbers and dealers, therefore, can well afford to carry stocks even when large, rather than sacrifice them under the market. Conditions are so uncertain that it would not be unwise at the present time to hold on to substantial stocks and where possible make accumulations, especially in the building lines.

EFFECT OF NEW RANGE PRICE ON NEW ENGLAND MARKET

One Central Station Announces Its Purpose to Discontinue Sale—Jobbers and Dealers Continue to Purohase at Same Rate

An inquiry last week by a representative of the ELECTRICAL WORLD as to the effect of the new range prices on the New England market led to the conclusion that as yet it is too early to judge this. The Boston Edison company is still selling at the old price ranges purchased and stocked before the advance, and the same thing is true of the Cambridge Electric Light Company. The Hartford Electric Light Company, on the other hand, declares that this increase appears to it to be unduly large and that the company will not offer to its consumers an article that it believes does not represent a fair return for their investment. That company, therefore, will discontinue the sale of electric ranges, except those now in stock or in transit at the old prices, until such time as it can feel that the ranges which its offers are fairly priced.

So far as it was possible to get in touch with the large operating syndicates with headquarters in New England, it appears that range sales are so scattered and in such moderate volume per company that no general conclusions can as yet be drawn regarding the willingness of the public to pay the new prices. Some of the larger companies in New England have never shown much enthusiasm over the range market development, but this appears to be due either to mistakes in earlier days or to the idea that the problem of water heating for quick service hitherto has been too troublesome. In some quarters the idea also obtains that the revenue from electric range service does not justify the sales effort and outlay for wiring, etc., necessary for a first-class installation.

In jobbing and distributing circles it appears that the dealers are continuing to purchase ranges at about the same rate as before the increase. Some jobbers pay much more attention to this class of business than do others. One of the larger jobbers reports that it is difficult to maintain a representative stock in face of the present demand, highly distributed though the latter is. It was pointed out that gas and other fuel ranges have risen probably 75 per cent in price within the last year and far more than this compared with pre-war quotations. It is maintained that a retail advance in a range suited for four persons from a former price of say $80 to $100 and of an eight-person range formerly sold at $120 to $150 will be cared for by the time-payment plan. The growing popularity of electric cooking, with its economic effect expressed in reduced shrinkage, etc., is believed by many to be beyond the reach of any such price fluctuations as drew forth the action of the Hartford company. Further light upon retail sales, however, is awaited by the trade with keen interest, for a protest against prices from so responsible a source challenges the manufacturer to set forth the propriety of an advance of the order which went into effect in July.

ENCOURAGING OUTLOOK IN THE BRASS MARKET

Electrical Manufacturers' Demands Well Handled—Effect of Recent Labor Disturbances Exaggerated—Copper Chief Factor

Electrical manufacturers have little cause for anxiety at present in regard to the supply of brass, notwithstanding recent increases in time of delivery due to labor disturbances in the Naugatuck Valley of Connecticut and elsewhere. A representative of the ELECTRICAL WORLD visited this section last week, getting in touch with leading manufacturers of brass and also with makers of schedule material, fixtures, fuses and portable lamps. In general it appears that the production rate of the brass mills is now substantially the same as in June. The labor troubles in the brass industries, which began at Ansonia and extended into Waterbury and the adjacent district early in the summer, culminated in a maximum of about 10,000 persons being out of work, whereas about 40,000 others employed in brass making and allied manufactures in the Naugatuck Valley remained loyal. At Waterbury, which produces not far from one-half the brass goods of America, strikes were on for about two weeks, but most of this time the large mills were kept going and the newspapers greatly exaggerated local disturbances of the peace.

The prices of copper and of labor have both advanced during the summer, and the former would have necessitated an increase in the price of brass even had labor costs remained stationary. In the Waterbury district unskilled labor in the brass industry received a general increase of 10 cents per hour, following an investigation of living costs and applying to workers earning up to 40 cents per hour. Skilled workers, receiving from 40 cents per hour upward, were granted an increase of 25 per cent, based on the wages of June 1. In general the eight-hour basic day has been established in Waterbury, with an excess allowance of time and one-half. The mills are running ten hours a day in the main, which means that a worker receiving 60 cents per hour before June 30, and earning $6 per day, now draws $8.24 for ten hours. About half the labor is skilled in this industry.

The price of copper has risen during the summer from

15 to 24 cents in the ingot. At the time of the strikes in the Naugatuck Valley copper was selling for 18 cents. Plating supplies advanced in price, as did zinc and spelter (the latter up 2 cents). It may be estimated that from 75 to 85 per cent of the selling price of brass is due to the cost of copper, and there is no question that the future prices of brass and the deliveries which can be made in sheets, rods, tubes and in finished products like socket shells depend far more upon the cost of copper than upon any other single item. For nearly a month now copper prices have been fairly steady. If a further advance should get under way, orders would pour into the brass mills at a rate which would probably upset present deliveries very badly; but if the price remains steady and labor continues to work as at present, it is likely that by the end of this year deliveries will be back to normal.

The following table shows how the base prices of brass and copper as used by electrical manufacturers increased from June 15 to Aug. 20:

BASE PRICES IN CENTS PER POUND

Sheet metal:	June 15, 1919	Aug. 20, 1919
High brass	20½	27½
Low brass	23	30½
Wire:		
High brass	20½	27½
Low brass	23	30½
Commercial bronze	24½	33½
Rods:		
High brass	19½	26½
Low brass	23½	31½
Commercial bronze	25½	33½
Brazed tubes:		
Brass	31½	39
Copper and commercial bronze	36½	44½
Copper:		
Sheet	25½	33½
In rolls	23½	31½
Drawn-copper shapes	22½	30½
Copper wire, bare (f. o. b. mill)	20	26¾

These prices include delivery from the mills up to 50 cents per 100 lb. freight rate.

The foregoing base prices illustrate quotations before and after the strikes in the Naugatuck Valley, but the advances are due to the rise in copper cost and only to a small extent to the wage increases. Brass workers at Bridgeport, Conn., received a 10 per cent wage increase in the late spring, but the advance in the copper price was so great that it is doubtful if labor cost has increased the price of brass by more than 1 cent or 1.5 cents per pound in the Naugatuck Valley.

The rising price of copper stimulated the demand of electrical manufacturers upon the brass mills, and in some cases lengthened deliveries by about thirty days. The simpler brass products naturally exhibit the best deliveries. Screw shells and socket shells can now be had generally on a thirty-day to forty-five-day basis, and in some cases deliveries can be made in two weeks, depending upon the popularity of the product. Factory stocks are low, both in finished brass products and in sheets, tubes and rods. The mills are having little difficulty, however, in getting either raw copper or labor, despite a slight shortage of unskilled help reported by one of the larger Waterbury mills. The shop committee system is being studied, and in one or two Bridgeport and Waterbury brass plants it is being given a trial. In most of these mills, however, the plan of individual dealings between concern and employee still holds. Orders are now being generally accepted with price guarantee to Nov. 1 and sometimes into December.

Most of the mills have at least three months' supply of raw materials on hand. Representative deliveries recently quoted are thirty days on seamless tubing, sixty days on sheet metal, four to six weeks on brass wire, and sixty to ninety days on copper wire. The demand for condenser tubing is low at present. The mills did not run full time for several months after the armistice, and were keeping orders well in hand at the time of the strikes. The present congestion existing in some of the mills is attributable chiefly to the rush of buyers into a rising copper market. One of the largest mills in the Waterbury district reported last week that the effect of recent labor trouble *per se* on production and deliveries is a thing of the past.

GREAT BRITAIN TO ABANDON RESTRICTIONS ON IMPORTS

Current Export of Electrical Equipment in United States to England Running Behind Previous Years

The government of Great Britain has decided to abandon on Sept. 1 the post-war plan of trade protection, under which imports were limited to those for which special licenses were granted by the Board of Trade. A number of electrical devices and materials have been put upon the restricted list, as reportd in the June 14 issue of the ELECTRICAL WORLD. The removal of these restrictions may increase considerably the exports of American electrical goods to England. During the first half of the current year exports to England of electrical goods amounted to $2,360,131, which is roughly at the annual rate of $5,000,000. This may be compared with a total of $5,650,229 in the fiscal year 1918, $7,041,484 in 1917, and $6,091,405 in 1916.

It is well known that English manufacturers have done everything in their power to secure to themselves the domestic electrical market. A number of new factories have started up and some of the war factories have gone into production of electrical materials. However, it is doubtful if the English producers can absorb the entire market in so short a time. Prior to the war a considerable part of the electrical supplies consumed in Great Britain were manufactured in Germany. It is hardly possible that electrical material will flow into Great Britain from this source in any large volume in the near future. This practically leaves the United States alone in the position of being able to supply the unfilled demands of the English market.

It is not improbable, however, that the English government may effect some legislation to prevent dumping, especially in the lines of the key industries. The manufacture of electrical equipment will probably be considered as one of the key industries.

WATERWHEEL MARKET STRONG AND CONTINUALLY IMPROVING

Reports from Manufacturers Show Satisfactory Business This Year and a Promising Future with Numerous Export Inquiries

Information has been received from several waterwheel manufacturers regarding the condition of the market as they find it. With but one exception they all are of the opinion that the market for the year to date has been, and the present market is, in a satisfactory condition. In some cases the average of sales for the first six months of the present year has been about the same as for each of the last five years. These sales have been and are now being well maintained and in one case were increased to 10 per cent over previous similar periods. Contrary to this rather general statement of prosperity, one manufacturer has found few inquiries and very little actual waterwheel business. During the first half year this concern manufactured for stock with a curtailed force.

At present the number of inquiries received is increasing steadily and shows a decided awakening interest among both large and small users of hydraulic prime movers. Sales resulting from these inquiries show a slight increase at the present time. In the one case where sales have not increased the cause was laid to the uncertainty of the general industrial situation.

The amount of waterwheel manufacturing capacity now being utilized varies from 30 per cent to nearly 100 per cent. This has even been exceeded in one instance where more equipment could be utilized if it were available. In another instance, where only one-half the shop is working, manufacturing is carried on for stock in the absence of new orders.

Excellent facilities and large capacity available for building waterwheels in some instances are responsible for rather

short deliveries. Depending upon the size and type of the unit, the time of shipment varies from one to nine months on standard equipment. The length of time required to make shipments seems to indicate rather clearly in several instances the exact condition of the market.

The consensus of opinion indicates that inquires for export are on the increase. The actual export sales are reported in one case as about normal, with an awakened interest among export buyers. Another report is that export demand is growing rapidly and is at present several times greater than in any other year. Furthermore, it has shown much better improvement than domestic business. From two sources, however, there has been a decrease in exports, and it is found that a very small percentage of the inquiries results in direct business. Although this condition may change, one manufacturer asserts that at the present time he finds the volume of foreign sales billed unsatisfactory.

The outlook in general is considered satisfactory and a bright future is predicted. In particular, the Pacific Coast has been referred to. More hydroelectric development is in sight there at this time than in the four-year period just ended.

The passage of a national water-power bill should still ther stir the market to an unprecedented extent according to the opinion of more than one manufacturer. The fact that the only contracts that are coming through are those that are absolutely essential has been given as one cause for an outlook which is not too encouraging. According to the preponderating opinion, however, it is apparent that there is considerable essential work coming through.

METAL MARKET SITUATION

General Tone Seems Easier, with Copper Down to 22 to 22¼ Cents for Prompt Shipments

There is an easier tone in the market to-day than there was two weeks ago. This appears to be a natural reaction to the recent heavy buying movement.

Copper, while rather strongly held by the producers at 23 cents and better, is freely quoted by outsiders at from 22 to 22¼ cents spot. Fall delivery can be had for ½ cent more.

There is only a fair demand for tin, which is held at from 54 to 55½ cents, dependent on quality. Straits tin is again coming into the domestic market and is being quoted at 55½ cents spot. Sales, however, will probably be made at lower prices.

Cold-rolled copper sheets are quoted at 33½ cents, seamless brass tubing at 36 cents, high brass sheets at 27.75, high brass rods at 26.75, low brass sheets at 30.50, and seamless copper tubing at 37.50 cents.

NEW YORK METAL MARKET PRICES

	Aug. 20	Aug. 27
Copper:	£ s d	£ s d
London, standard spot	100 15 0	98 10 0
	Cents per Pound	Cents per Pound
Prime Lake	23.50	23.00
Electrolytic	23.00	22.00 to 22.25
Casting	22.12½	21 75
Wire base	25.00	26.00
Lead, trust price	6.00	6.00
Antimony	8.75	8.62½
Nickel, ingot	41.00	41.00
Sheet zinc, f. o. b. smelter	10.50	10.50
Spelter, spot	8.00	7.90
Tin	60.00	55.50
Aluminum, 98 to 99 per cent	32.00 to 33.00	32.00 to 33.00

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	18.00 to 18.50	18.00 to 18.50
Brass, heavy	10.50 to 11.00	10.50 to 11.00
Brass, light	9.00 to 9.50	9.00 to 9.25
Lead, heavy	5.00 to 5.10	5.00 to 5.10
Zinc, old scrap	5.00 to 5.25	5.00 to 5.25

THE WEEK
IN TRADE

IN SPITE of labor disturbances, business in electrical goods continues to grow better, although just at present power deliveries and local strikes in the building trades are hampering business somewhat.

Evidences of the expansion in building are seen in the increasing demand for the smaller sizes of conduit, rubber-covered wire, especially No. 14, snap and push-button switches and in general all schedule material. Stocks in these lines are being rapidly depleted, and manufacturers are very busy. Non-metallic flexible conduit is also having a heavy sale. Prices are increasing and deliveries are lengthening.

Socket-device business continues large and prices are now stiffening. In a number of lines deliveries are getting poorer, which has a tendency, especially on the Pacific Coast, to hamper sales. Ranges have taken a second advance. As a result New England central stations are refusing to push them. Just the opposite, however, seems to happen in the South. All reports seem to indicate that fan stocks are pretty well depleted.

During the second and third weeks of August the estimated total of sales booked of code wire was lower than the total for the first week. But during this first week estimated sales booked of No. 14 rubber-covered wire were only 49 per cent of the code wire, while during the next two weeks the percentage of No. 14 to total code wire increased to 74 and 72 per cent respectively. During the week of Aug. 15 to 21 estimated sales booked of No. 14 rubber-covered wire were just over $350,000, and of total code wire just over $490,000.

Shipments of new motors are reported to be lengthening. Second-hand motors are almost unobtainable in the central section.

Prices continue to show higher tendencies, and deliveries are getting longer in a number of lines.

NEW YORK

The anticipation that the supply business would become better as the summer wore on is working out in true form. It is not uncommon to learn of business turned down because of short supplies. There is much supply trade that can't be satisfied because of poor deliveries, with many factories working to capacity and freight embargoes contributing to bring about a constant extension in the length of shipments.

Wiring material and attachments are reflecting building and the great demand for appliances and lighting fixtures. Rubber-covered wire sales are working the factories to capacity and making shipments longer, poor stocks resulting in the house-wiring sizes. Rigid conduit is moving in increasing volume. This is especially true of sizes under 1 in., although the larger sizes around 3 in. show by their sales the better volume of work in installations of large current capacity.

MOTORS.— A good amount of large-capacity work is pending which is expected to be placed shortly, and several orders each for a few large motors are going through. Factory stocks on these sizes are being depleted and shipments lengthening.

SWITCHES.—Snap and push-button switches and fittings are moving in large volume. Some production is sold out for three months.

NON-METALLIC FLEXIBLE CONDUIT.—A scarcity in jobbers' stock of this material has been reported this week. The large amount of small building is bringing an increased demand from manufacturers. Prices in this commodity continue firm.

RIGID CONDUIT.—There is a large movement of ½-in. size and better movement of larger-size conduit. Some manufacturers have issued card 43.

OUTLET BOXES.—Shipments have been reported as lengthening.

WIRE.—Rubber-covered is quoted this week on a standard 30-cent base.

SURFACE RACEWAY.—Better buying is reported, with good deliveries. Fittings are behind in deliveries.

SIGNS.—Factories are pretty well up to capacity and are getting back to normal after the heavy drain of the early part of the year.

CHICAGO

Jobbers in this section are feeling the effects of the lockouts and strikes more every week. Moreover, manufacturers are suffering not only from men lost by strikes, but also on account of the fact that many laborers are this year taking vacations which they could not afford in former years. No Chicago city permits for apartment houses were taken out during the past week on account of the lockout in the building trade, and most of the few permits were for repair work. Among the new projects for Chicago are a four-million-dollar State Hospital and an apartment house to cost $1,500,000. At St. Louis an apartment and theater costing $650,000 is to be built, in addition to three other large buildings and a church. The Standard Steel & Tube Company and the Refrigeration Engineering Company will each spend $500,000 on factories in Toledo. Plans are under way for three new hotels at Minneapolis, to cost a total of $4,000,000. The Northern States Power Company has contracted to supply service to the new union depot at St. Paul, Minn., for a load of 1500 kw. A shoe factory at $110,000 is to be erected at Vandalia, Ill.

WIRE.—The prices of wire have not changed during the week, the base price for rubber-covered being 30 cents, for weatherproof 28 cents, and for bare wire 27 cents. Scarcity of No. 14 rubber-covered wire continues. The larger sizes cannot be readily obtained from the mills.

HEATING APPLIANCES.—One manufacturer of heating appliances increased the list prices from 7 per cent to 25 per cent last week. One manufacturer advanced the price of travelers' irons $1 and domestic sizes 50 cents on Aug. 21. This manufacturer can make deliveries from stock on most orders, but another manufacturer is about two months behind. Three lines of ranges were increased 10 per cent on Aug. 18. This is the second advance within a month.

ELECTRIC OVENS.—One manufacturer of large, heavy-duty bake ovens is six months behind on orders, due to scarcity of skilled labor. There was a 20 per cent increase in the price of these ovens about the middle of August.

SCHEDULE MATERIAL.—Jobbers still have great difficulty in getting deliveries, and their stocks are now pretty well depleted.

NON-METALLIC CONDUIT.—Stock on hand is very low, factory deliveries are poor, and there has been an increase in price of 10 per cent to 12 per cent.

FURNACE ELECTRODES.—Deliveries can be made from stock on most standard sizes. Because many furnaces are not operating to capacity, the demand for these electrodes is comparatively small. The price of electrodes for a year's supply is unchanged at about 6½ cents per pound for the carbon electrodes in the 10-in. or 12-in. size, and 19 cents to 26 cents per pound for the graphite electrodes, depending upon the size.

FANS.—Jobbers and retailers report that practically all the fan stocks are now gone, with the exception of small odd types.

SECOND-HAND EQUIPMENT.—It is difficult to buy any second-hand motors, although some dealers are offering the highest prices they have ever paid. There is a particular scarcity of alternating-current motors of all sizes. Second-hand dealers are handling new equipment in order to take care of their customers.

ELECTRIC ROAD TRUCKS.—There is a good demand for both foreign and domestic delivery.

NON-FERROUS ELECTRIC FURNACES.—The demand for brass furnaces is very active. A number of foundry buyers are in the market.

RIGID CONDUIT.—Stock on hand is fair. There is no large demand on account of the builders' lockout in Chicago.

INSULATING MATERIALS.—The supply of fiber and cloth insulating material on hand is very good. Prices have not advanced lately.

BOSTON

Despite labor troubles present and imminent, trade is very active. Building construction in New England is increasing by about $6,000,000 per week, exceeding both 1917 and 1918 to date, even when present prices are prorated on the business of both years. Designing engineers are busy on new work. The Hartford (Conn.) Electric Light Company contemplates building a 100,000-kw. oil-burning steam-turbine plant in the early future, and the United States government expects to erect a number of important buildings at the New London naval base. Electrical contractors are increasingly active and jobbers are rushed to fill orders for material. Any tendency toward overstocked shelves appears to have been sharply checked. Delieveries are growing longer, although the resumption of work in schedule material and brass factories in Connecticut is helping shipments in these lines. Prices tend to stiffen, especially in appliances. Recent sweeping advances in electric range prices have greatly disturbed the trade. Increases in vacuum cleaner and motor prices are being noised about as among the prospects of early fall. Collections are in good shape. Shortages still persist in some descriptions of wiring material.

VACUUM CLEANERS.—The outlook for fall trade is very bright, about the only fly in the ointment being a possible oversold market. Prices tend to stiffen.

WASHERS.—Increased manufacturing facilities have enabled the enormous demand of this year to be well cared for. Jobbers are trying hard to prepare for fall business, but the steady sale of machines makes stock accumulation extremely difficult.

MOTORS.—Trade is spotty this week. Smaller sizes of motors are in chief demand, and single-phase motors are scarce. Rumors of higher prices in the fall are heard in the trade.

SCHEDULE MATERIAL.—The factories are very busy and jobbers are running lower in stocks. Deliveries are still good, however, two weeks being quoted on some lines.

IRONS.—A heavy business is being maintained, and as yet there appears to be no serious falling off in trade due to the recent price advances.

WIRE.—Base prices remain practically the same as last week. A fair demand is reported, and the smaller sizes of wire are widely sought. Stocks are fair.

FUSES.—Factory stocks are well prepared to meet increased demands. The fuse output appears to be below that of 1918 to date. Prices are steady, and no difficulty is reported in obtaining raw materials.

FLASHLAMPS AND BATTERIES.—Stocks are in good shape to meet present requirements. Prices hold steady. Purchases by jobbers for the holiday trade will begin in a few weeks. Current demand is only moderate.

RANGES.—Recent price advances have deterred buying. Fair stocks remain in the hands of retailers and these are generally being sold at the earlier prices or 5 per cent above. The Hartford Electric Light Company and Worcester Electric Light Company have decided to purchase no ranges at the new prices for resale to their customers, and the Boston Edison company will not stock any ranges at the present prices.

LAMPS.—The central stations and jobbers will enter the fall unusually well prepared for business. Deliveries are more satisfactory.

ATLANTA

There are no surface indications of any let-up in business. Buying orders for all materials are being placed covering current demand and anticipating poor deliveries as the year advances. Jobbers are complaining more regarding the slowing up of shipments, and there seems to be no hesitancy in predicting that transportation problems this fall will be as bad as, if not worse than, during the war. Although labor conditions in the Carolinas have improved, the utility situation is still unsettled. The street-car men at Louisville went out on strike this week.

A survey of manufacturers' collections shows an excellent condition, and in specific instances collections of accounts due have run as high as 85 per cent. Jobbers are taking care of their obligations in good shape, little paper being outstanding. Industrials are especially prompt and municipals are coming through satisfactorily.

LAMPS.—There was a revival of activity last week, and movement of stocks has quickened. Miniature demand has shown a perceptible abatement, but with daylight hours decreasing from now on, it is expected that the volume of business will be greater than ever. Stocks are well filled.

WIRE.—Requirements are heavy and no cessation is in evidence. Weatherproof is hard to obtain. One jobber's base for weatherproof is 31 cents, and for rubber-covered 30 cents. Shipments are uncertain.

FANS.—The call at present is slightly greater than previous seasons, and it is only natural that activity from now on will grow less. Stocks are pretty well cleaned out.

VACUUM CLEANERS.—These are moving somewhat more slowly this week. Local stocks, however, are low and shipments are not improving.

WASHING MACHINES.—The volume of business to date has outstripped anything transacted in the past, and jobbers state that it is only a question of getting the goods. Factories are increasing their shipment promises, and arriving lots are less each week. Atlanta stocks generally are low.

NON-METALLIC CONDUIT.—The extraordinary demand has practically exhausted the Southeastern stocks. Considerable difficulty is being experienced by jobbers in securing substantial lots for quick delivery. Prices advanced 20 per cent last week.

DISHWASHERS.—These are going strong, and as a result local stocks are depleted. Factory deliveries are very uncertain, and the outlook for improvement is discouraging.

RANGES.—One distributer reports this item as accelerating considerably during the past two weeks. In certain sections ranges are being pushed through local dealers and central stations on short campaigns. Prices advanced 25 per cent. Factories are promising six-week deliveries.

ELECTRIC PORTABLE SEWING MACHINES.—Activity continues. Sales so far this year are running well ahead of 1918, while prices remain steady. Shipments are reported good. Local stocks are in fair condition.

FLATIRONS.—The present demand exceeds anything seen in the past, and the sales to date are several hundred per cent over last year. Dealers cannot keep any stock. Deliveries are promised in six weeks. Prices advanced 10 per cent.

STARTING AND LIGHTING BATTERIES.—Distributers and dealers are enjoying a big trade and shipments are good. Local stocks are well up to normal. Prices are firm.

SEATTLE—PORTLAND

Business among electrical jobbers during the week showed no improvement. One of the largest jobbing houses in Seattle says that conditions of the trade are holding up well considering the season. Retailers report domestic-appliance sales well sustained and note an increase in sales of house-wiring devices, fixtures and lamps. Reports from many sections of the Northwest indicate no slackening in construction work, which ordinarily experiences a dull period at this time. Statements from certain cities in eastern Washington and the southwestern part of the state show almost a boom in building. New building contracts for Seattle let last week will entail expenditure of approximately $1,000,000. This sum does not include residences and outbuildings. However, unless pending demands of certain of the building trades unions for wage increases ranging from 11 to 33⅓ per cent are withdrawn or modified, construction in Seattle is liable to be reduced to a minimum. The Seattle master builders' association has threatened to shut down work on jobs controlled by its members.

J. D. Ross, superintendent of municipal lighting for Seattle, has recommended to the board of public works that order be placed immediately for 2,000,000 lb. of copper wire to be used to transmit energy from the proposed Skagit River project to the city.

The finance committee of the Council has recommended for passage an ordinance appropriating $432,000 for the Skagit project to construct a sawmill, temporary electric plant, etc. The Pacific Power & Light Company, Portland, has awarded contracts for the erection of buildings for the proposed seven-hundred-and-fifty-thousand-dollar power plant in Astoria. It is understood some of the electrical equipment has already been ordered. The Oregon Casket Company, Portland, has awarded contract for the erection of an electrically operated factory to cost $175,000. Gradually the shortage of cars for moving products of Oregon and Washington is becoming more acute.

Portland territory reports that business conditions have not changed much in the past three weeks. There is the usual line of small business, which keeps the volume about the same as it has been for some months past.

WIRING DEVICES.—The demand is good and prices remain steady, although in the opinion of some jobbers prices will advance considerably soon. Sockets, switches, etc., are moving rapidly; still stocks are in good condition. A substantial demand for wiring material is noted, particularly in Puget Sound cities.

ELECTRIC SIGNS.—It is believed that the fall volume will be exceptionally active. Jobbers have prepared for considerable business. Inquiries from small-town business houses are numerous.

SAN FRANCISCO

Southern California is bottled up because of a strike of railroad switchmen and shopmen called in sympathy with the electric railway strike. Noteworthy big building reported includes a contract at $5,500,000 on the Hetch Hetchy dam for the city of San Francisco, with an extensive electrical equipment; a court house at $500,000 for Santa Barbara, and a community apartment house for San Francisco that will eclipse anything on the Pacific Coast in size and modernity.

SOCKET DEVICES.—The crux of the problem for increased distribution of socket devices is liberal credit to dealers and reasonable partial payments by consumers. The credit managers of the larger firms have under consideration various schemes in this regard. The sale of washing machines and vacuum cleaners has been hampered by poor factory deliveries, this condition extending to practically all makes.

CONDUIT.—A 3 per cent advance in black, galvanized, and sherardized conduit has taken place. Apartment-house construction has demanded several large assorted orders, on which immediate delivery was obtained from local stocks.

SCHEDULE MATERIAL.—Prices are still steady, save for the introduction of quantity lots on the basis of 500 split pieces or 1000 socket pieces. A big increase in standard business is reported. The numbers demanded are of the most staple kind.

RADIATORS.—A large local manufacturer reports the doubling of last year's business from advance sale indications.

LAMP CORD.—There has been a big diminution of demand because of new fixture designs. A large sale of fixture wire has been reported, by the way, for shipment to the French Orient, double-braid protection being specified.

Current Prices of Electrical Supplies

New York and Chicago Quotations

THE prices quoted are those prevailing in standard packages of specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit.

Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers. Price variations may be due to difference in grade of products of different manufacturers, to local conditions, or to both.

Armored Conductor, Flexible Steel

Single-Conductor

B. & S. Size	List per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE AND DISCOUNT PER 1000 FT.—NEW YORK

Single-Conductor

	No. 14 Solid
Less than coil	+10% to 20%
Coil to 1000 ft	List to 25%
	No. 12 Solid
Less than coil	+10% to 20%
Coil to 1000 ft	List to 25%

Twin-Conductor

	No. 14 Solid
Less than coil	+10% to 20%
Coil to 1000 ft	List to 25%
	No. 12 Solid
Less than coil	+10% to 20%
Coil to 1000 ft	List to 25%

DISCOUNT—CHICAGO

Single-Conductor

	No. 14 Solid
Less than coil	List
Coil to 1000 ft	5%
	No. 12 Solid
Less than coil	Lis
Coil to 1000 ft	5%

Twin-Conductor

	No. 14 Solid
Less than coil	$90.00 to $100.00
Coil to 1000 ft	85.00 to 82.50
	No. 12 Solid
Less than coil	List
Coil to 1000 ft	5%

Attachment Plugs

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+20%
1/5 to std. pkg	List
Std. pkg	15%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+20% to list
1/5 to std. pkg	List to 20%
Std. pkg	23% to 36%

Batteries, Dry

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.45	$0.45
12 to 50	.40	.40
50 to barrel	.36	.37
Barrel lots	.329	.339

Batteries, Dry—*Continued*

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.45	$0.45
12 to 50	.38	.38 to $0.39
50 to barrel	.362	.372
Barrel lots	.332	.342

Conduit, Metallic Flexible

Size, In.	Ft. per Coil	List per 100 Ft.
⅜	250	$5.00
½	250	7.50
¾	100	10.00
1	50	13.00
1¼	50	21.00
1½	50	26.00
2	25–50	35.00
2½	25–50	45.00
3	25–50	52.00

NET PER 1000 FT.—NEW YORK

	Less than Coil	Coil to 1000 Ft.
½-in. single trip	$75.00	$63.75— 69.75
½-in. double strip	75.00— 82.50	72.00— 75.00
¾-in. single strip	100.00	85.00— 93.00
¾-in. double strip	100.00—110.00	96.00—100.00

NET PER 1000 FT.—CHICAGO

	Less than Coil	Coil to 1000 Ft.
½-in. single strip	$75.00	$63.25 to $63.75
½-in. double strip	78.25	71.25
¾-in. single strip	100.00	75.00 to 85.00
¾-in. double strip	105.00 to 109.00	93.00 to 95.00

Conduit, Non-Metallic Flexible

Size, In.	List per Foot	Size, In.	List per Foot
⅜	$0.05½	1	$0.25
½	.06	1¼	.33
¾	.09	1½	.40
¾	.12	1¾	.47
⅞	.15	2	.55
1	.18	2½	.65

NET PER 1000 FT.—NEW YORK

	Less than $15 List	$15 to $60 List	$60 to $150 List
⅜-in.—	$35.00	$27.50	$26.50
½-in.—	35.00	30.00	29.00

NET PER 1000 FT.—CHICAGO

	Less than 250 ft.	250 to 2500 ft.	2500 to 10,000 ft.
⅜-in.—	$48.00	$27.75	$26.00
½-in.—	$52.00	30.50	28.25

Conduit, Couplings and Elbows, Rigid Iron

Card No. 42

Size, In.	Conduit, List per Foot
⅜	$0.08½
½	.08½
¾	.08½
⅞	.11½
1	.17
1¼	.23
1½	.27½
2	.37½
2½	.58½
3	.76½

Conduit, Couplings and Elbows, Rigid Iron—*Continued*

Size, In.	Couplings, List	Elbows, List
⅜	$0.05	$0.19
½	.06	.19
¾	.07	.19
⅞	.10	.25
1	.13	.37
1¼	.17	.45
1½	.21	.50
2	.28	1.10
2½	.40	1.80
3	.60	4.80

DISCOUNT—NEW YORK

	⅜ in. to ½ in.	¾ in. to 3 in.
Less than 2500 lb.	1% to 12.1%	3% to 14.1%
2500 to 5000 lb.	6% to 15.1%	8% to 17.1%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	⅜ to ½ In.	¾ to 3 In.
Less than 2500 lb.	+3% to 3.1%	2% to 2.1%
2500 to 5000 lb.	+1% to 5.1%	4% to 7.1%

(For galvanized deduct six points from above discounts.)

Flatirons

NEW YORK

List price	$6.50 to $7.50
Discount	25%

CHICAGO

List price	$6.50 to $7.50
Discount	25% to 30%

Fuses, Inclosed

250-Volt	Std. Pkg.	List
3-amp. to 30-amp.	100	$0.25
35-amp. to 60-amp.	100	.35
65-amp. to 100-amp.	50	.90
110-amp. to 200-amp.	25	2.00
225-amp. to 400-amp.	25	3.60
450-amp. to 600-amp.	10	5.50
600-Volt		
3-amp. to 30-amp.	100	$0.40
35-amp. to 60-amp.	100	.60
65-amp. to 100-amp.	50	1.50
110-amp. to 200-amp.	25	2.50
225-amp. to 400-amp.	25	5.50
450-amp. to 600-amp.	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	30%
1/5 to std. pkg	40%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	30%
1/5 to std. pkg	40%

Fuse Plugs

3-Amp. to 30-Amp.

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg	$6.00 to $8.75
1/5 to std. pkg	5.50 to 7.00

Standard packages, 500. List, each, $0.07

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg	$8.00
1/5 to std. pkg	7.00

Standard packages, 500. List each, $0.07

Lamps, Mazda or Tungsten

110 to 125 Volts

Regular, Clear:	Std. Pkg.	List Each
10 to 40-watt—B	100	$0.35
60-watt—B	100	.40
100-watt—B	24	.85
75-watt—C	50	.70
100-watt—C	24	1.10
200-watt—C	24	2.20
300-watt—C	24	3.25
Round Bulbs, 3½-in., Frosted		
15-watt—G 25	50	.60
25-watt—G 25	50	.60
40-watt—G 25	50	.60
Round Bulbs, 3½-in., Frosted:		
60-watt—G 30	24	.82
Round Bulbs, 4½-in., Frosted:		
100-watt—G 35	24	1.15

DISCOUNT—NEW YORK

Less than std. pkg.	List
Std. pkg.	10%

DISCOUNT—CHICAGO

Less than std. pkg.	List
Std. pkg.	10%

Lamp Cord

Cotton-Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$28.60–$35 01
Coil to 1000 ft.	25.74– 29.17

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$23.00–$34 00
Coil to 1000 ft.	23.00– 25.00

Lamp Guards, Wire

Standard packages from 50 to 150

NEW YORK

Net per 100	$29.70 to $33.00

CHICAGO

Net per 100	$29.70 to $33 00

Outlet Boxes

Nos.	List per 100
101—A, A 1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200, S.E., 300, A.X., 1½, 4 S.	30.00
103—C.A., 9, 4It, B 1½	25.00
106—F.A., 7, C.S., 1½, 3 R	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	26%–38%	20%–33%
$10.00 to $50.00 list	36%–47%	31%–43%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $10.00 list	33%–40%	24%–32%
$10.00 to $50.00 list	45%–50%	32%–43%

Pipe Fittings

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

Porcelain Cleats—Unglazed

Two and Three Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg.	$17 85 to $22 40
1/5 to std. pkg.	14 70 to 15 35

Standard package, 2200. List per 1000, $21 to $34

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg.	$17 85–$18.00
1/5 to std. pkg.	14 70– 15.00

Standard pkg., 2200. List per 1000, $20.00 to 21.00

Porcelain Knobs

NEW YORK

Per 1000 Net.	Std. Pkg. 3500. 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 N.C.
Less than 1/5 std. pkg.	$13 60–$15.00	$22.00–$22.40
1/5 to std. pkg.	10.50– 11.20	15.35– 18.00

CHICAGO

Per 1000 Net.	Std. Pkg. 3500. 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 N.C.
Less than 1/5 std. pkg.	$13.60	$25 00
1/5 to std. pkg.	11.50	21 50

Sockets and Receptacles

	Std. Pkg.	List
½-in. cap key and push sockets	500	$0.33
½-in. cap keyless socket	500	.30
½-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+20%
1/5 to std. pkg.	List

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	+20 to list
1/5 std. pkg.	List to 10%

Switches, Knife

250-Volt, Front Connections, No Fuse

High Grade:	
30-amp. S. P. S. T.	$0.80
60-amp. S. P. S. T.	1.20
100-amp. S. P. S. T.	2.25
200-amp. S. P. S. T.	3.48
300-amp. S. P. S. T.	5.34
30-amp. D. P. S. T.	1.20
60-amp. D. P. S. T.	1.78
100-amp. D. P. S. T.	3.38
200-amp. D. P. S. T.	5.20
300-amp. D. P. S. T.	8.00
30-amp. 3 P. S. T.	1.80
60-amp. 3 P. S. T.	2.68
100-amp. 3 P. S. T.	5.08
200-amp. 3 P. S. T.	7.80
300-amp. 3 P. S. T.	12.00
Low Grade:	
30-amp. S. P. S. T.	$0.42
60-amp. S. P. S. T.	.74
100-amp. S. P. S. T.	1.50
200-amp. S. P. S. T.	2.70
30-amp. D. P. S. T.	.68
60-amp. D. P. S. T.	1.22
100-amp. D. P. S. T.	2.50
200-amp. D. P. S. T.	4.50
30-amp. 3 P. S. T.	1.02
60-amp. 3 P. S. T.	1.84
100-amp. 3 P. S. T.	3.76
200-amp. 3 P. S. T.	6.76

DISCOUNT—NEW YORK

	High Grade
Less than $10 list	+15%
$10 to $25 list	2%
$25 to $50 list	5%
	Low Grade
Less than $10 list	+5%
$10 to $25 list	80%
$25 to $50 list	15%

DISCOUNT—CHICAGO

	High Grade
Less than $10 list	+25%
$10 to $25 list	+10%
$25 to $50 list	+5%
	Low Grade
Less than $10 list	+15%
$10 to $25 list	2%
$25 to $50 list	5%

Switches, Snap and Flush

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single-pole	250	$0.28
5-amp. single-pole, ind.	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind.	100	.54
5-amp. three-point	100	.54
10-amp. three-point	50	.76
10-amp., 250-volt, D. P.	100	.66

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	70

Switches, Snap and Flush—*Continued*

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+20%
1/5 to std. pkg.	List
Std. pkg.	15% to 17%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	+20%
1/5 to std. pkg.	List
Std. pkg.	23%

Switch Boxes, Sectional Conduit

Union and Similar—	List Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	18%–20%	List–18%
$2.00 to $10.00 list	28%–30%	5%–28%
$10.00 to $50.00 list	45%–50%	10%–47%

DISCOUNT—CHICAGO

	Galvanized	Black
Less than $2.00 list	30% to 33%	24% to 25%
$2.00 to $10.00 list	30% to 33%	24% to 25%
$10.00 to $50.00 list	30% to 45%	25% to 36%

Toasters, Upright

NEW YORK

List price	$6.00 to $7.00
Discount	25%

CHICAGO

List price	$7.00
Discount	25% to 30%

Wire, Annunciator

NEW YORK

	Per Lb. Net
No. 18, less than full spools	$0.52
No. 18, full spools	.51

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.54 to $0.57
No. 18, full spools	.48 to .51

Wire, Rubber-Covered, N. C.

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$16.00	$13.00	$13.00
12	21.78	21.78	18.15
10	31.18	27.67	22.64
8	42.12	38.77	31.64
6	61.16	55.60	50.04

CHICAGO

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 2500 Ft.	2500 to 5000 Ft.
14	$25.00	$14.00	$14.00
12	30 00	19 00	19.00
10	35.77	35 77	30.66
8	42 84	42 84	36.72
6	67.80	67.80	56.50

Wire, Weatherproof

Solid-Conductor, Triple-Braid, Size 4/0 to 3 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb	$34.00
25 to 50 lb	34.00
50 to 100 lb	33.00

CHICAGO

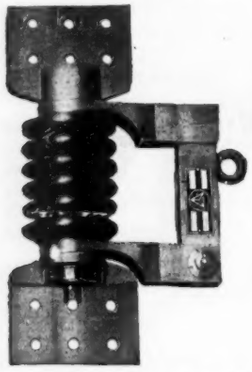
	Per 100 Lb. Net
Less than 25 lb	$30 75
25 to 50 lb	30 75
50 to 100 lb	30.75

NEW APPARATUS & APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Unit-Type Bus Sectionalizing Switch

The unit-type bus sectionalizing switch recently developed by the Delta-Star Electric Company, 2433 Fulton Street, Chicago, and known as "TT-14,"



RIGIDLY CONSTRUCTED AND EASILY INSTALLED

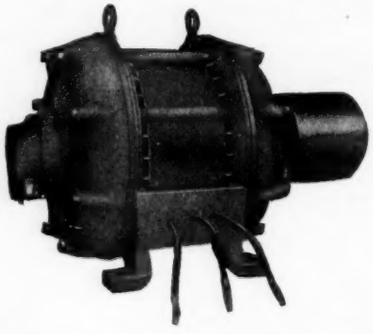
can be clamped directly to the bus section, its corrugated insulator being shunted with a hinged blade that can be set at any desired angle to the bus. The rigidity of its construction and its easy installation are features of the switch.

One of its applications is in a bus structure having reactors which are to be cut out of service at intervals for cleaning or inspection. This can be accomplished by installing the new switch on either side of, and in series with, the reactors, this switch normally being in open position. A third switch is installed on a separate bus section, shunting the reactors, this switch normally being in open position.

Constant-Speed Squirrel-Cage Induction Motors

Constant-speed, polyphase, squirrel-cage induction motors have recently been brought out by the Cleveland Electric Motor Company, 5311 Windsor Avenue, Cleveland, Ohio. They are of the riveted-frame, sleeve-bearing type and are intended for 25-cycle and 60-cycle operation.

The stator of these motors is provided with windings in which special attention has been given to the istallation in the slots and between phase coils. The connections are firmly held in place and standard windings are designed to permit reconnecting to various standard voltages. Sufficient space is allowed inside of the bearing bracket to afford easy assembling of the coils. Laminations are assembled by a special method which is said to eliminate flaring of the teeth. Either open or inclosed type slots can be furnished. The bars of the rotor are connected to the short-circuiting rings by welding. Laminations are fastened together, making an integral unit very compact and rugged. The shafts are made of special steel and are of unusual size, it is said, affording rigid construction and minimizing any variation in the air gap. They can be readily removed from the rotor in case of necessity, without disturbing the core and windings. The diameter of the shaft at the bearing is larger than its diameter at the pulley extension, thereby permitting the shaft to be turned down in case it should become scored. Oil grooves prevent the oil from creeping along the shaft. Strong air currents are set up by a fan and are directed through the motor in such a manner that the heat generated in the windings is



RIVETED-FRAME, SLEEVE-BEARING TYPE

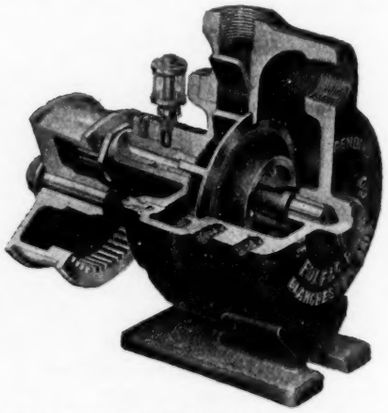
rapidly dissipated. The bearing bracket shoulder projects above the stator and ring, allowing the bearing bracket to be easily removed. The rigid three-arm housings are designed to provide sufficient cooling and to protect the winding amply. Openings are provided in the baffle plate to permit insertion of air gaps. Laminations are exposed directly to the air, permitting rapid radiation of heat. They are thoroughly annealed and coated with insulating varnish. The readily accessible set screw is firmly fastened at the housing, thereby preventing rotation of the bearing. Both the oil gages and the fillers are applicable to either side of the housings. The oil reservoirs can be filled through the gages without disturbing any of the dust-proof coverings. The bearings are interchangeable and self-aligning and are fitted in the housings with a light pressed fit against the shoulder to receive the rotor end thrust. An ample supply of oil is secured by the use of special oil rings. The cap screw is readily removable.

Compact Reversing Centrifugal Pump

A small, compact reversing centrifugal pump, having the prime retaining, non-clog advantages of the machine tool pump made by the Fulflo Pump Company of Blanchester, Ohio, has recently been placed on the market by this concern. It is made up of parts which are interchangeable with the 1918 model of this company's pump and incorporates a number of new features.

Reversing in the pump is effected through the design of the volute and the incorporation of a gate in the discharge opening which deflects the water as the pump is reversed from one direction to the other. The gate is made of bronze and mounted on a bronze pin, eliminating any corrosive action and always insuring a free movement of the gate. The pulley can be run in either direction and can be reversed from one direction to the other, giving quick flow upon starting the pump or reversing the direction.

The packing, as can be seen in the accompanying illustration, is placed near the water chamber which protects the main bearing. The gland, which is also the bearing, is snugly



CUT-OUT SECTION SHOWING POSITION OF PACKING

fitted in the stuffing box and is readily accessible when it is necessary to adjust the gland to tighten the packing, obviating the necessity of removing

any part in order to make adjustments. Ample oiling features are provided for all bearings through the continuous oiler provided on top of the pump cover. The intake opening is placed high above the water chamber to insure a full prime. No valves are required, either relief or check; neither is it necessary to use a starter as all openings in the pump are large and anything entering the pump can go right through. There are no contact fits or rubbing action to wear out and give trouble, thus eliminating delays on production work for repriming and unclogging and other familiar pump troubles, the maker points out.

The pump, as regularly furnished for ¾-in. (19-mm.) piping, has a capacity of 15 gal. (57 l.) a minute with a 15-in. (38-cm.) suction lift and a 48-in. (121-cm.) head lift at a pulley speed of 450 r.p.m. By increasing the pulley speed greater volume, suction and head lifts can be obtained. As much as 30-in. (76-cm.) suction can be obtained, the maker states. The pump is capable of pumping 20 gal. to 25 gal. (76 l. to 95 l.) a minute when provided with 1-in. (25-mm.) piping, for which liberal arrangements have been made in the design of the pump.

High-Temperature-Measuring Instrument

In operating the high-temperature-testing meter lately placed upon the market by the Brown Instrument Company of Philadelphia all that is necessary for its use is to connect the thermocouple with the instrument binding post in the usual manner, press a button, turn it off and take the reading, which will be the correct emf. of the thermocouple at its hot end, even if the line is very long. In fact, the line may have as much as 15 ohms resistance. The movable system consists of a highly sensitive copper or aluminum wire coil suitably mounted in an intensive magnetic field.

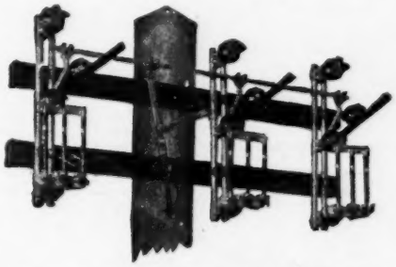
AUTOMATIC DEVICE LOCKS NEEDLE WHEN COVER CLOSES

Other features of this instrument are said to be that it requires no dry cells or standard cells, is independent of line or thermocouple resistance and has a negligible temperature coefficient. The instrument is equipped with a locking device or needle which is operated automatically by the opening and closing of the cover.

Switch with Self-Renewing Fuses

Self-renewing fuses are one of the features of the standard type No. 400 switches which the Pacific Electric Manufacturing Company, 827 Folsom Street, San Francisco, is now offering. In the make-up of the switches the upper ends of the fuse tubes are supported by a common conductor, but the lower ends are insulated from each other, and the spring contacts capable of connecting them are held apart by explosive cartridges.

In operation electrical energy is first supplied to the apparatus served by this switch through a fuse to the observer's right, but should this fuse rupture, a discharge occurs through the middle fuse across gap in the cartridge. The cartridge's explosion permits the spring contacts closing together, thereby putting the middle fuse into operation. The same sequence replaces the middle fuse with the left-hand one in the event of its rupture. It is pointed out by the maker that the cutting over of the fuses in the switch is not instantaneous, and thereby time is allowed for the cessation of short circuits that are not permanent.



RUPTURING ONE FUSE PUTS NEXT ONE INTO OPERATION

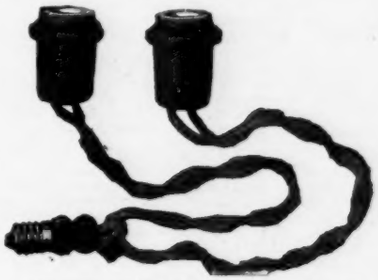
Industrial Locomotive Headlights

The "Golden Glow" electric headlights, type L-128, have been developed by the Electric Service Supplies Company, Cambria and Seventeenth Streets, Philadelphia, principally for use on industrial, yard and small logging locomotives or wherever the amount of light required does not warrant the use of larger and more powerful types of headlights.

The cases and all principal metal parts of the headlights are made of sheet steel with the exception of the base, which is cast. They are finished inside and out in black baked enamel. Twelve-inch (30-cm.) mirror reflectors are used, and the headlights can utilize 100, 150 and 250-watt concentrated filament incandescent lamps (type C). A type B focusing device is used on these headlights, consisting of a mechanism controlled entirely by a single adjusting screw. In operation it moves the lamp inward or outward until it is brought into proper focus. As the adjusting screw extends through the back of the lamp it is readily accessible from outside.

Miniature Plug for Series Christmas Tree Sets

Trouble is often experienced with eight-light series operating on the ordinary house circuit. When the pressure goes above 100 volts the lamps are apt to burn out very quickly. A solution for this trouble may be found in using nine lamps instead of the usual eight.



ALLOWS ADDITIONAL LAMP TO BE CONNECTED IN SERIES

For this purpose the M. Propp Company, 108 Bowery, New York City, has developed the "two-in-series" "volt lifter," which is wired to receive two lamps in series. By removing any lamp in the eight-lamp set from its socket and replacing it with the "volt lifter" nine lamps can be used in series, thereby lifting the voltage to that suitable for the circuit, which increases the life of the lamp. The device, as can be seen in the accompanying illustration, consists of a miniature attachment plug to which are connected two miniature lamp sockets.

NOTES ON RECENT APPLIANCES

Electric Washing Machine

A vacuum-type electric washing machine is being marketed by the National Sewing Machine Company, Belvidere, Ill.

White-Enameled Annunciator

Edwards & Company, Exterior and 140th Streets, New York City, have placed on the market the "San-Fer-Ann" electric annunciator, with white-enameled steel case.

Combination Electric Sewing Machine and Writing Desk

The Free Sewing Machine Company of Rockford, Ill., is manufacturing a sewing machine which may be folded to form a neat writing desk.

Manufacturers' Activities

FRANK C. VAN ETTEN has resumed his position in the engineering department of the Delta-Star Electric Company, Chicago, after an absence of eighteen months in France, where he has been connected with some of the largest installations in the A. E. F. as captain in the Ordnance Department.

BRYANT WORKERS GO BACK.—Fifteen hundred workers of the Bryant Electric Company, Bridgeport, Conn., on strike for three weeks, have voted to accept a compromise offer of the company, continuing to work forty-eight hours a week with increases amounting to approximately 20 per cent. The demand of the strikers was for a 25 per cent wage increase and a forty-four-hour week.

STANDARDIZATION OF INVOICES.—The National Association of Purchasing Agents, which last year adopted a standard catalog size, is now conducting a campaign to adopt standard forms for invoices, purchase orders, acknowledgments and notices of shipment. The standardization committee has called a conference of individuals and representatives of associations to meet at the Bellevue-Stratford Hotel, Philadelphia, Saturday, Sept. 20, at 10 a. m., to consider this subject.

NATIONAL LAMP WORKS TO RETAIN FIVE-LAMP CARTON.—The National Lamp Works of the General Electric Company announce that they are not changing their packing methods, but are retaining the five-lamp carton. In the July 19 issue of the ELECTRICAL WORLD the impression was given that all Mazda lamp interests were to drop the new method of packing. The National Lamp Works, however, feel that the five-lamp carton is preferable, and for that reason are doing all that they can to popularize this means of packing.

THE PIERCE FUSE CORPORATION, Buffalo, N. Y., announces that Hight & Stout, 345 Fifth Avenue, New York City, will be its selling agents for New York City and vicinity and that R. S. Blake, at 322 Sherman Street, Chicago, will handle this corporation's products there. A. H. Nickerson, formerly of the Adapti Company, is its representative in Cleveland with offices at 310 Lennox Building. Glenn A. Wilson has severed connections with the Franklin Incadescent Lamp Company of the Westinghouse Lamp Company and has taken over the Pierce fuse account in Syracuse, Rochester, Albany, Wilkes-Barre, Binghamton and Batavia.

THE BELDEN MANUFACTURING COMPANY'S new building, known as No. 8, is four stories high and contains 10,000 sq.ft. of clear floor space. The first floor is to be used for shipping, receiving and stock rooms until the permanent structure to house these departments is built; the second floor will be devoted to the excess needs of several departments; the third floor will be used entirely for the manufacture of textile magnet wire, while the fourth floor will be given over to the manufacture of Beldenamel magnet wire, it being

NEW BELDEN PLANT IN CHICAGO

so designed that the entire process can be conducted on one floor. A spur track from the belt-line railway adjoining will be built at an elevation even with the second story. This will permit loading and unloading by a special conveying system designed to eliminate as far as possible the manual handling of goods. Space in the present factory building now occupied by the magnet wire and enameled wire departments will be used for expansion of the rubber-covered wire and cord departments.

THE PERFECTION STORAGE BATTERY COMPANY, INC., 1175 Bedford Avenue, Brooklyn, N. Y., announces a capital increase from $3500 to $25,000.

THE FISHER GOVERNOR COMPANY has opened a New York office at 1 Franklin Street in charge of P. L. Rhodes. A stock of the better-selling sizes and types of the company's specialties will be carried in stock.

FRANK D. SHUMATE, for a number of years Chicago manager of the Worthington Pump & Machinery Company, has been elected vice-president and general sales manager of the newly reorganized Chalmers Pump & Manufacturing Company, Lima, Ohio.

THE SIBLEY-PITMAN ELECTRIC CORPORATION, 190 Sixth Avenue, New York City, jobber of electrical supplies, has recently filed notice with the Secretary of State of an increase in its capitalization from $150,000 to $250,000 for proposed business expansion.

FRED H. ALDEN has sold his entire interest in the Illinois Wire & Cable Company, and he withdrew from all connection with the affairs of the company on Aug. 1. Mr. Alden had been closely identified with the business of that company for more than five years.

M. W. BARTMESS, who for thirteen years was connected with the engineering department of the Westinghouse Electric & Manufacturing Company and who for the last seven years has been in the motor engineering department of that concern, has resigned to accept a position as chief designing engineer for the motor department of the Adams-Bagnall Electric Company, Cleveland, Ohio.

C. LINCOLN SMITH, who in the past has been sales engineer for the Sanford Riley Stoker Company and the Murphy Iron Works in the Chicago territory, has been transferred to the Pittsburgh office. On and after Aug. 15 Mr. Smith will act as district manager, looking after the sales and service for both the Riley underfeed stoker and the Murphy automatic furnace in the Pittsburgh district.

THE STERLING ELECTRIC COMPANY of Minneapolis, Minn., and the Kelley Hardware Company of Duluth held a sales convention at Minneapolis Aug. 14 to 16 of manufacturers, jobbers, dealers and salesmen, with an attendance of about 200. They included all of the dealers and salesmen handling the Gainaday washing machine, the Ohio Tuec vacuum cleaner, the Simplex ironing machine, the Rudd Automatic water heater and the White portable sewing machine. All were given an opportunity to give their views. Manufacturers furnished the statistics on the magnitude of the household utility business and impressed upon the jobbers, dealers and salesmen the necessity of getting busy and reaping the benefits of the big business which is now at hand. Among those attending the convention were: W. L. Rodgers, president Pittsburgh Gage & Supply Company, and J. R. Spencer, sales manager; H. G. Grosse, president of the American Ironing Machine Company; C. S. Beardsley, general manager United Electric Company; A. P. Brill, general manager Rudd Manufacturing Company; W. H. Vilett, president Sterling Electric Company; Harry Bohn, general manager household utilities department of Sterling Electric Company; W. N. Hart, general manager Kelley Hardware Company; R. Hilgedick, sales manager household utilities department, of the Kelley Hardware Company; Fred P. Tosch, secretary and treasurer Farmers' Electro Lighting Corporation; G. N. Holloway of the Mason City Electric Company; P. D. Kline, vice-president and general manager Wisconsin-Minnesota Light & Power Company, together with eight managers of its various plants; Guy Bisbee, president of the Fixture Equipment Company, and others from the States of North Dakota, South Dakota, Iowa, Wisconsin and Minnesota.

THE FEDERAL SIGN SYSTEM (ELECTRIC), New York City, announces that for the purpose of improving its export service it has taken over the Federal Electric Company, formerly at 52 Broadway, New York City, and that B. Blum, former managing director of the Federal Electric Company, is appointed export manager of the Federal Electric Company, representing the Federal Sign System (Electric). In 1877 Mr. Blum started in business with Roosevelt Brothers, Cornelius & Hilbourne, the original and only

B. BLUM

manufacturers of Leclanché batteries. Three years later he joined the forces of J. H. Bunnell & Company, manufacturers of telegraph, telephone and miscellaneous electrical supplies, with whom he remained for eight years. In 1887 he started a general electric export business and two years later organized the Wenstrom Dynamo & Motor Company, railway motor manufacturer. Mr. Blum organized the Federal Electric Company in 1900 and became its managing director. Mr. Blum will be at the New York headquarters of the company, 649 West Forty-third Street, New York City, and all correspondence should be sent to the above address. The company carries a stock of standard merchandise as listed at New York, Chicago, San Francisco and New Orleans and is in a position to give prompt and efficient service, in washing machines, vacuum cleaners, special signs, electric lanterns, electric whistles, porcelain enamel steel signs, porcelain sockets and bushings, renewable fuses, electric sirens and specialties.

Foreign Trade Notes

WELDERS FOR SWEDEN.—According to the secretary to the American Trade Commission at Stockholm, Sweden, electric welders, both spot and seam, offer a large field, as there are few in Sweden.

CHINESE MARKET FOR SMALL ELECTRIC PLANTS.—According to the Far Eastern Division of the Bureau of Foreign and Domestic Commerce, there is a market in Swatow, China, for small electric plants consisting of about the following type: 90 kva. (90 per cent power factor) generator of 2200 volts and 25 amp., with a direct-connected 135-hp. engine, without a condenser, making 154 revolutions a minute. The lamp capacity is 5000 20-watt lamps supplied by an alternating current of 60 cycles per second, delivered to consumers at 110 volts. Electric lighting is becoming very popular in the interior cities, and small kerosene and gasoline generators supplying about 200 lamps are used by private concerns. In order to secure this business in competition with other countries, American representatives will have to get in personal touch with prospective buyers. No business can be done by correspondence or by catalogs, and in placing the larger orders preference is generally given to bidders who engage to erect the plant and start it in operation, as the Chinese have little knowledge of electrical machinery. (Refer to file No. 117,829.)

NEW FORMOSA PLANT.—A new hydroelectric plant will be erected in Taiwan, Formosa, under government auspices.

DRAFT OF CHINA'S REVISED TARIFF.—The Asia Banking Corporation, 35 Broadway, New York City, has published the draft of the Chinese tariff as revised by the Tariff Revision Commission and sent to Peking for ratification.

AUSTRALIAN WIRE IMPORTS. — It is reported in the London *Electrician* that the recent order governing the importation of rubber-covered wire into Australia will not go into effect until Jan. 1, 1920. The order was originally designed to go into effect July 1, 1919.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

An agency is desired by a man in Italy (No. 30,394) for the sale of electric wire. Correspondence may be in English.

Electrical novelties are required by a merchant in France. (No. 30,378). Terms cash against documents. Correspondence should be in French.

About 4 tons of copper wire, 3 mm. to 8 mm. thick, is required by a firm in Switzerland (No. 30,438). Correspondence should be in German.

A man from Australia (No. 30,239) who is in the United States wishes to secure an agency on a commission basis for the sale of electric fittings.

A firm in Trieste (No. 30,381) desires to purchase and secure an agency on commission for electrical appliances. Quotations should be given c. i. f. Trieste.

Catalogs, price lists and samples of all sorts of bare and insulated copper wire, stranded cable and all sorts of lamp cord are desired by a firm in Norway (No. 30,366).

An importing company in India (No. 30,393) desires to come into direct touch with manufacturers of parts for motor vehicles, such as lamps, horns, storage batteries and coils.

The director of agriculture of a government of Europe (No. 30,395) desires to have manufacturers forward catalogs and other information relative to town and village lighting systems.

The manager of an American firm (No. 30,356), having ramifications in all West Indian islands, now in this country but sailing shortly, desires complete catalogs and prices of machinery for telephone systems.

A merchant in France (No. 30,399) desires to secure an agency for the sale of electrical apparatus and equipment, such as bells, electric light accessories, telephone equipment and switchboards. Correspondence should be in French.

An agency is desired by a man in Switzerland (No. 30,362) for the sale of measurement apparatus for heating and ventilating, long-distance thermometers, thermostats, anemometers and automatic temperature regulators. Correspondence may be in English.

Electric lighting plants and electric fans for table, wall and ceiling, especially single-phase, three-cycle, 115-volt ceiling fans, are required by a firm in India (No. 30,404). Quotations should be given f.o.b. New York. Payment, telegraphic transfer on New York with order.

Iron plates for electrical machinery, asbestos, abestos cardboard, insulating bands, tinned steel wire, oiled gauze, mica, paraffin paper, lacquered paper, oiled paper, resin, tubular soldering or welding, string and oiled cloth are required by a company in Belgium (No. 30,361). Quotations should be given c. i. f. Antwerp. Correspondence may be in English.

Albert B. Singer of the Leland-Giorgi Company, 1133 Broadway, New York City, importer and exporter, desires to secure connections with American manufacturers dealing in telephone apparatus, electric meters, water meters, refrigerating apparatus and electrical supplies. The main office of the above company is in Florence, Italy, and the desire is to secure Italian representation of American manufacturers of the listed equipments.

Trade Publications

INSULATOR CAP.—Hickey & Schneider of Elizabeth, N. J., are circulating an illustrated folder covering their new insulator cap.

PORTABLE ELECTRIC OZONATORS.—The Sprague Electric Works of the General Electric Company, New York City, have issued a folder covering their portable electric ozonators.

UNDER-FEED STOKER.—The Under-Feed Stoker Company of America, Book Building, Detroit, has published a thirty-two-page catalog covering the Jones "Standard" under-feed stoker.

STORAGE BATTERIES.—The Prest-O-Lite Storage Battery Company of Indianapolis has published a wall spread showing some sixteen views of its plant No. 2 at Indianapolis, Ind.

DOMESTIC DISH-WASHING MACHINE.—The Whirlpool Manufacturing Company of Philadelphia is distributing a circular that tells about its "Whirlpool" electric dish-washer for home use.

ADJUSTABLE FAN HANGER OUTLET.—The Frank Adam Electric Company of St. Louis, Mo., is circulating an illustrated folder descriptive of its new adjustabe electric fan-hanger outlet.

TRIPLETONE BELLS.—The Buhl Specialty Company, 9807 Easton Avenue, Cleveland, Ohio, is distributing an illustrated circular covering its "Tripletone" electric bell, which gives three separate sounds.

OSCILLATING-TUB ELECTRIC WASHER.—The Coffield Motor Washer Company of Dayton, Ohio, has recently issued a leaflet the subject of which is its improved oscillating-tub electric washing machine.

GASOLINE DISPENSER.—A mailing folder is being circulated by the visible Measure Gasoline Dispenser Company of America, Louisville, Ky., to describe the Brady system of visible measure gasoline dispensing.

PORTABLE MOTION-PICTURE PROJECTOR.—The De Vry Corporation, 1250 Marianna Street, Chicago, has published an illustrated booklet which tells of the advantage of its portable motion-picture projector in classroom instruction.

INDUSTRIAL LIGHTING. — Harvey Hubbell, Inc., Bridgeport, Conn., has prepared a wall chart showing designs and size of Hubbell industrial lighting reflectors to be used with lamps of certain wattage to obtain various results in lighting.

SPRAY NOZZLE.—The Star Brass Works of Chicago have just issued a twenty-four-page bulletin, No. 5, covering atomizing and spray nozzles for special applications. It deals with the application of spray nozzles for all industrial purposes and also gives the engineering data involved.

ELECTRIC RANGE MANUAL. — The Hughes Division of the Edison Electric Appliance Company, 5660 West Taylor Street, Chicago, has just published the Hughes Electric Range Sales Service Manual, which is especially intended for the central station or dealer contemplating putting on an electrical range campaign.

CHRISTMAS TREE LIGHTING SETS.—The M. Propp Company, 108 Bowery, New York City, has issued a price list effective Sept. 1, 1919, for its electric Christmas tree lighting sets. The list also contains descriptions and illustrations of a new "volt lifter" as well as a lamp tester and several miniature lamp sockets.

INDUSTRIAL LOCOMOTIVES AND TRUCKS AND TRACTORS.—The Koppel Industrial Car Equipment Company of Koppel, Pa., has issued a complete catalog, part of which is devoted to illustrations and descriptions of industrial storage-battery trucks, tractors, charging equipment and electric locomotives and electrically driven cars.

POLES AND POLE BRACKETS.—Illustrated catalog No. 35 issued by Elmer P. Morris of New York City is descriptive of plain and ornamental cast and wrought steel tubular poles and pole brackets for electric railways, electric lighting, telegraph and telephone service. It also contains descriptions and illustrations of overhead-line material for electric light and railway use.

New Incorporations

THE OLYMPIA (WASH.) BATTERY COMPANY has been incorporated with a capital stock of $3,000 by A. H. Hepner, C. L. Senges and C. P. Uitweer.

THE EXCEL BATTERY WORKS, 1502 South Wabash Avenue, Chicago, Ill., has been incorporated by F. A. Liggett, P. A. Thompson and Stephen Keller. The company is capitalized at $10,000 and proposes to manufacture electric batteries, etc.

THE MAGNETO GENERATOR STARTER ELECTRIC COMPANY of Jersey City, N. J., has been organized to manufature electric starters for automobiles and other purposes. Andrew J. Weger, 2527 Boulevard, is interested in the company.

THE PHILLIPS TIME SWITCH COMPANY of Hnutington, Conn., has been chartered by L. W. Holmes, C. F. Holmes and W. E. Fisher, all of Shelton, Conn. The company is capitalized at $50,000 and proposes to manufacture electric time switches, etc.

THE PORTABLE ELECTRIC CURRENT PATENTS COMPANY has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $10,000,000. The incorporators are J. D. Frock, S. L. Mackey and M. C. Kelly of Wilmington.

THE HUMIL CORPORATION of New York, N. Y., has been incorporated with a capital stock of $300,000 to manufacture electrical apparatus. The incorporators are J. Van Harder, H. H. Thurlow and F. D. Hagan, 55 Liberty Street, New York City.

THE METRIC APPLIANCE CORPORATION of New York, N. Y., has been incorporated by A. W. Franklin, M. B. and D. B. Kessel, 47 West 112th Street, New York City. The company is capitalized at $20,000 and proposes to manufacture electric meters.

THE ELECTRO THERMAL CONTROL CORPORATION of Los Angeles, Cal., has been incorporated with a capital stock of $100,000 by Frank W. and E. B. Foster and R. R. Whitcomb of Artesia. The company proposes to manufacture equipment for heat regulation.

THE NEWARK (N. J.) MOTOR PRODUCTS MANUFACTURING COMPANY has been incorporated by Otto and H. J. Weber and Albert J. Farmer. The company is capitalized at $100,000 and proposes to manufacture motors and other electrical goods.

BROMUND & SON, INC., of Camden, N. J., has been incorporated with a capital stock of $50,000 by H. W. Bromund, Jr., J. Lambrecht and Francis J. Smith, 509 Federal Street, Camden. The company proposes to manufacture electric lighting fixtures and appliances.

THE AMERICAN ELECTRIC STORAGE BATTERY COMPANY of Philadelphia, Pa., has been incorporated by E. M. MacFarland and F. R. Hansell, Land Title Building. The company is capitalized at $1,000,000 and proposes to manufacture storage batteries, etc.

THE MILLER BROTHERS ELECTRICAL COMPANY of Portsmouth, Va., has been incorporated with a capital stock of $25,000 to do a general electrical supply and construction business. E. R. Barksdale is president and H. G. Walker is secretary, both of Portsmouth.

THE LOCKE INSULATOR CORPORATION OF MARYLAND, Maryland Tract Building, Baltimore, Md., has been organized by Donald Symington, W. Stuart Symington, Jr., and William Gilmor Hoffman. They propose to manufacture electric transmission insulators and appliances.

THE SIMPLEX METAL SPINNING & STAMPING COMPANY of New York, N. Y., has been incorporated by S. Silverstein, L. M. Murray and D. D. Shapiro, 1541 President Street, Brooklyn, N. Y. The company is capitalized at $10,000 and proposes to manufacture electric fixtures, etc.

THE SAFETY FIRST TAIL-LIGHT COMPANY of Indianapolis, Ind., has been incorporated by George W. Nicholson, Arthur J. Kelly, Nelson L. Arbuckle, A. C. Dodds and George V. Harpin. The company is capitalized at $10,000 and proposes to manufacture electrical and other lighting devices.

New England States

BAR MILLS, ME.—Plans are being prepared by the Bar Mills Power Company for extensions to its hydroelectric power plant.

MANCHESTER, N. H.—The Board of Aldermen is considering extending the ornamental lighting system on other business streets, aside from Elm Street. The lamps are to be of the same type as those that have been voted for Elm Street, to be maintained by underground wires. The cost is estimated at about $125 per lamp. The Manchester Traction, Light & Power Company has the contract for street lighting.

BOSTON, MASS.—A generator in the power house of the Edison Electric Illuminating Company at Salem and Prince Streets was destroyed by fire recently, causing a loss of about $10,000.

MARLBORO, MASS.—The City Council is considering establishing a municipal electric light plant for Marlboro. Raoul H. Beaudreau, city solicitor, has been authorized to engage an engineer to appraise the plant of the Marlboro Electric Company.

MARLBORO, MASS.—Work has begun on the erection of a transmission line to connect the Marlboro service with the lines of the Edison Electric Illuminating Company and the New England Power Company. A substation will be built at the corner of Garfield and Florence Streets. The proposed line will be about 3 miles long and will cost about $50,000.

NEW BEDFORD, MASS.—Plans are being prepared by the J. G. White Engineering Company of New York, N. Y., for a large power plant to be erected at the head of Gean Street for the National Spun Silk Company.

SOUTHWICK, MASS.—Bonds to the amount of $15,000 have been voted for the installation of an electric lighting system. Energy to operate the system will be secured from the Westfield municipal electric plant.

WILLIAMSTOWN, MASS.—Plans are being prepared by E. F. Saxton, consulting engineer and architect, Tremont Building, Boston, for the construction of a 500-loom weaving and spinning mill for the J. S. Boyd Company, to cost about $500,000; also for a water-power development.

WOBURN, MASS. — The Algonquin Leather Company and the American Agriculture Company have petitioned the City Council for permission to erect electric wires on New Boston Street. The latter company is a new enterprise which is to locate near the plant of the Merrimac Chemical Company and will erect a plant to cost about $250,000. Both companies have decided to operate their plants by electricity.

BRIDGEPORT, CONN. — The Nichols Underwear Company is planning to erect a power house in connection with its new factory building. Fletcher & Thompson of Bridgeport are engineers.

BRIDGEPORT, CONN.—Work is progressing favorably on the construction of a new two-story factory with power plant by the Nichols Underwear Company, 395 James Street. The structures will be about 75 ft. by 195 ft. and 20 ft. by 20 ft. respectively, and are estimated to cost $80,000.

HARTFORD, CONN.—Contract has been awarded by the Jewel Belting Company for the erection of a five-story factory, a two-story storage building, a one-story leather storage building and a power house to Frank Meagher of Hartford. The total cost is estimated at about $30,000.

HARTFORD, CONN.—Preliminary plans are being prepared by the Stone & Webster Engineering Corporation of Boston, Mass., for the construction of a large electric generating station on Colt Meadows, near the Connecticut River, for the Hartford Electric Light Company. The proposed plant will have a capacity of 100,000 kw. to 125,000 kw. and will use oil for fuel. Samuel Ferguson is vice-president.

MIDDLETOWN, CONN.—The Russell Manufacturing Company is planning to erect a new power plant, including engine and turbine room, boiler department and pumping room, in connection with an addition to its webbing mills.

MYSTIC, CONN.—Plans are being prepared by the Packer Tar Soap Company, Lincoln Avenue, for the construction of a storage plant, factory building and power house, to cost about $40,000. Bilderbeck & Langdon, Barrows Building, New London, are engineers.

PLAINVILLE, CONN.—It is planned to erect a high-tension transmission line from the power station in New Britain to the center of Plainville.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

Middle Atlantic States

BINGHAMTON, N. Y.—Arrangements are being made by the Binghamton Light, Heat & Power Company for the installation of a 2500-kw. generator at its plant. Work has been started on the erection of a new transmission line to the plant of the Endicott-Johnson Corporation at Endicott.

BUFFALO, N. Y.—The Stewart Motor Company, 425 East Delavan Avenue, is planning to remodel and install new equipment at the plant of the Cyphers Incubator Company on Dewey Avenue, which it recently acquired. The cost of the improvements is estimated at $150,000.

CANANDAIGUA, N. Y.—Plans are being prepared by the Lisk Manufacturing Company for the erection of a power house, 63 ft. by 87 ft., at its works.

GENEVA, N. Y.—The City Council has completed plans for the installation of a pumping unit at the municipal waterworks, to replace the two 2,000,000-gal. units now utilized at the plant. The new unit will have a capacity of 4,000,000 gal.

NEW YORK, N. Y.—Plans have been filed by Edwards & Company, Exterior Street, corner of 140th Street, for extensions and improvements to its plant, to cost about $40,000. The company manufactures electrical equipment, alarms, etc.

OSWEGO, N. Y.—The City Council is considering the installation of a complete electric lighting system, to cost about $90,000.

BAYONNE, N. J.—The board of directors of Bayonne City Hospital is planning to build an addition to hospital, also power plant and nurses' home, to cost about $250,000. R. Sluter, 79 West Forty-first Street, is member of committee.

NEWARK, N. J.—The Cocoanut Oil Company is planning to erect a power plant in connection with its new works on Passaic Avenue, near Chapel Street, to cost about $300,000.

NEWARK, N. J.—The New York Telephone Company, 15 Dey Street, New York, N. Y., is planning line improvements and extensions to its system in the northern New Jersey district, to cost about $3,270,000. Edmund W. Wellmuth is district manager.

PHILLIPSBURG, N. J.—The Borough Council has authorized Borough Engineer Tilton to prepare plans for a new sewage-disposal plant. The proposed plant will have a capacity of 3,000,000 gal. and will cost about $125,000. Considerable electrical and mechanical equipment will be required in connection with the work.

TRENTON, N. J.—The City Commissioners have approved an appropriation of $115,000 for the installation of electrically operated pumping machinery and auxiliary equipment at the municipal waterworks pumping station.

ASPINWALL, PA.—The Mackintosh-Hemphill Company of Pittsburgh has purchased a site in Aspinwall for a new plant. The present plant of the company is at the foot of Twelfth Street. The company manufactures steel castings, electrical products, etc.

BETHLEHEM, PA.—The Traveler Tire & Rubber Company, 819 North Broad Street, Philadelphia, contemplates the construction of a power plant in connection with its new tire factory at Travelers Avenue and Auburn Street, Bethlehem. The cost of the entire plant is estimated at about $125,000.

CHESTER, PA.—A power plant will be built at the Chester Hospital in connection with the erection of a new surgical pavilion. The cost of the proposed work is estimated at about $250,000.

EAST STROUDSBURG, PA.—The International Boiler Works is planning to rebuild its plant, recently destroyed by fire. The loss is estimated at about $300,000.

NICETOWN, PA.—Bids will be received at the office of the constructing quartermaster, U. S. Midvale gun plant, Nicetown, Philadelphia, until Sept. 2, for construction complete of finishing machine shop and heat-treatment building and half-yard runways. Plans and specifications may be obtained at the above office.

PHILADELPHIA, PA.—Plans have been prepared for the installation of an electrically operated pumping plant at the city waterworks at Lardners Point.

PHILADELPHIA, PA.—The A. Shoenut Company, Amber and Venango Streets, is planning to build a power house in connection with the erection of an addition to its woodworking plant, to cost about $44,000.

BALTIMORE, MD.—The Baltimore & Ohio Railroad Company is reported to be considering equipping a section of its road, a distance of 17 miles, for electrical operation in the vicinity of Keyser, W. Va.

CROWNSVILLE (R. D. ANNAPOLIS), MD.—Plans are under way for the construction of a 6000-hp. power plant at the Crownsville State Hospital; also heating and refrigerating plants. C. L. Roeder, Park Avenue and Saratoga Street, Baltimore, is construction engineer.

UNION BRIDGE, MD.—Plans are under consideration by the Union Bridge Electric Manufacturing Company for extension of its electric transmission lines to New Windsor, Taneytown, Legore, Key Mar, Middleburg, New Midway and other towns in this district. At Legore the company will connect with the system of the Hagerstown & Frederick Railway Company. The company now supplies service to Union Bridge and Linwood.

NEW CUMBERLAND, W. VA.—The West Virginia-Pittsburgh Coal Company is considering the installation of a power plant at its La Belle mines. Improvements will be made in the transportation system at its properties. The cost of the work is estimated at about $100,000.

GRAFTON, W. VA.—The Potomac Edison Company has been incorporated with a capital stock of $4,000,000 to take over the properties of the Edison Electric Illuminating Company of Cumberland, Md.; the Cumberland Electric Railway Company, West Virginia Central Gas Company, West Virginia-Maryland Gas Company of West Virginia, Maryland Gas Company, Hartland Power Company, and other electric light and power companies. The company proposes to build a power plant near coal mines to supply the entire section between Maryland and West Virginia.

WELLSBURG, W. VA.—The Wellsburg Electric Light Company is considering the erection of a new substation.

WHEELING, W. VA.—The engine department at the power plant of Wilson & Company, Wheeling, was recently destroyed by fire, causing a loss of about $10,000.

WASHINGTON, D. C.—Plans are being prepared by the Ordnance Department United States Army, Washington, D. C., for a new aviation station on Staten Island, including shops and buildings, etc., to cost about $1,000,000.

North Central States

ALLEGAN, MICH.—The Overton Creamery Company, it is reported, is asking for bids for construction of creamery and dairy and power house, to cost about $100,000. The McCormick Company, Century Building, Pittsburgh, is architect.

DETROIT, MICH.—The city of Detroit has had plans prepared for the construction of a subway system in the congested section, comprising Woodward, Monroe, Michigan, Grand River and Jefferson Avenues, to cost about $6,000,000. H. H. Esselstyn is chief engineer.

HIGHLAND PARK, MICH.—Bids will be received at the office of the city clerk, 20 Gerald Avenue, Highland Park, until Sept. 8 for furnishing four motor-driven centrifugal pumping units and one motor-driven vacuum pumping unit, consisting of one pumping unit of 5600 gal. per minute, 20-ft. head; one pumping unit of 3500 gal. per minute, 20-ft. head; two pumping units of 3500 gal. per minute, 125-ft. head, and one vacuum pumping unit of approximately 50 cu.ft. free air per minute. Plans and specifications may be obtained from L. C. Whitsit, city engineer, 28 Gerald Avenue, upon deposit of $10. C. Gowing is city clerk.

VASSAR, MICH.—Bonds to the amount of $30,000 have been voted for the installation of a new plant to replace the present gas producer plant now in use. The proposed new steam-driven plant will insure a twenty-four-hour service, a better street-lighting service and ornamental lamps.

CHILLICOTHE, OHIO.—Estimates are being prepared for the installation of an independent lighting system for Camp Sherman, to cost from $25,000 to $40,000.

ELYRIA, OHIO.—The Willys-Overland Company has purchased a site of 160 acres on the outskirts of the city, on which, it is stated, the company will erect a large engine plant. Sleeveless engines and an engine for home-lighting plants will be manufactured.

HAMILTON, OHIO.—The Doron Electrical Company is planning to erect a new plant on North B Street, to cost about $14,000.

LORAIN, OHIO.—The City Council is considering a new street-lighting proposal submitted by the Lorain County Electric Company.

ARCOLA, IND.—Steps have been taken to organize a company to establish an electric light plant in Arcola.

ROCHESTER, IND.—The City Council has called a special election to submit to the voters the proposal to establish a municipal electric light plant to supply electricity for lighting the streets of the city and for pumping the city water, and also to install an ornamental lighting system on Main Street and Court Square, total cost of these improvements not to exceed $50,000.

WARSAW, IND.—The Indiana Public Service Commission has instructed the Winona Electric Light & Water Company to erect a new pumping station and lay new mains.

CHARLESTON, ILL.—The Coles County Telephone & Telegraph Company is planning to place all its wires underground, at a cost of about $57,000.

CHICAGO, ILL.—Contract has recently been awarded by the Belden Manufacturing Company, 2300 Southwestern Avenue, for the erection of a new factory building at its plant at Kilpatrick Avenue and West Congress Street, to be used for its magnet wire departments.

DEER CREEK, ILL.—A company has been organized to supply electricity for lamps and motors in Deer Creek, Cruger and adjacent territory. Energy to operate the proposed system will be supplied by the Peoria (Ill.) Light & Power Company, which will erect a substation at Cruger. The company is capitalized at $25,000. J. A. Danforth is president and F. L. Delsley secretary and treasurer of the new company.

ELGIN, ILL.—Plans are being prepared for the construction of a municipal electric light and power plant, to cost about $200,000. The proposal to issue bonds for same will soon be submitted to the voters.

ELGIN, ILL.—Owing to a strike on the lines of the Aurora, Elgin & Chicago Railroad Company, which has tied up the electric light and power service in Elgin and adjacent towns, the management of the Sherman Hospital has decided to install an electric generator. Mrs Mary A. Prase is chairman of the committee appointed to purchase the equipment.

OSWEGO, ILL.—Plans are under consideration for the installation of a municipal electric lighting system, to cost about $70,000. John A. Buesel is consulting engineer.

ROCK ISLAND, ILL.—The Root & Van Dervoort Engineering Company is planning to install a complete electrical dynamometer-testing laboratory under the supervision of Charles P. Grimes, devlopment engineer. This will be the fourth laboratory of this type to be installed by Mr. Grimes. The company has recently secured an order from the Moline Plow Company for 12,000 automobile motors of the six-cylinder valve-in-head type.

WOODSTOCK, ILL.—Contract has been placed by the City Council for a new generating unit for the municipal electric plant. An addition will be made to the power house to provide space for the new machinery.

GREEN BAY, WIS.—Property owners in nine blocks of Washington Street, the chief business section of the city, have petitioned the City Council to install an ornamental lighting system.

DAVENPORT, IOWA.—Permission has been granted the Tri-City Railway & Light Company for the erection of an electric transmission line from Brady Street Road at the city limits of Davenport to Five Mile House.

ST. CHARLES, IOWA.—The Gibson Electric Company of Des Moines will make improvements to its local power plant, including the installation of three fuel-oil engines, from 10 hp. to 50 hp., three generators from 8 kw. to 35 kw., and four switchboard panels complete. Overhead material for 10 to 20 miles of overhead line will be required. G. T. Gison, Box 408, Des Moines is in charge of the work.

STORM LAKE, IOWA.—Bonds to the amount of $100 000 have been voted for the installation of a municipal electric light plant.

ST. LOUIS, MO.—The Municipal Dock Department is in the market for cranes and other equipment for the municipal docks provided for the government barge line operating out of St. Louis.

ST. LOUIS, MO.—Contract has been awarded by the Shultz Belting Company to the John W. Cowper Company, Fidelity Building, Buffalo, N. Y., for the construction of a new power plant at its works, to cost, including equipment, about $100,000.

ST. LOUIS, MO.—Plans have been prepared by J. A. Hook, director, and C. S. Butts, engineer, both of the Board of Public Utilities, and an appropriation of $1,920,000 has been made by the city of St. Louis for the construction of an electric railway belt line to connect the Municipal and McKinley bridges. The work will include laying 63 miles of track of the United Railway Company and extensions to several other lines, and also the connection of the Terminal Railroad with Wiggins Ferry and Mill Creek Valley yards and elimination of surface grade of the Missouri Pacific Railroad tracks on Poplar Street. Plans have also been drawn for the construction of elevated railway tracks and approach to the Municipal Free Bridge at southern terminus, for which another appropritaion of $1,300,000 will be made.

MINDEN, NEB.—Bonds to the amount of $35 000 have been voted for improvements to the municipal electric light plant.

PARTRIDGE, KAN.—Bonds to the amount of $20,000 have been voted for the erection of an electric transmission line.

Southern States

GREENSBORO, N. C.—The City Commissioners have authorized the Mayor and City Clerk to enter into a contract with the North Carolina Public Service Company for lighting the streets for a period of ten years from Nov. 20, 1920. The contract provides for removing the overhead wires from Elm Street and the installation of ornamental lamp posts on that thoroughfare.

SUMMERVILLE, S. C.—The Summerville Public Service Company, recently organized, has purchased the local electric light and ice plant and contemplates improvements to same. M. Barshay is president.

SUMTER, S. C.—Improvements are contemplated to the municipal electric lighting system, involing an expenditure of about $88,000. The proposed work will include the installation of a 1000-kw. turbine-generating unit, surface condenser, water-tube boiler, stoker, brick, chimneys, spray-cooling equipment and boiler-feed pumps.

ALBANY, GA.—The Georgia-Alabama Power Company has awarded contract for the construction of dam and power house at Porter Shoals on Flint River north of Albany to the Hardaway Contracting Company of Columbia, Ga. The plans provide for a development of from 12,000 hp. to 15,000 hp., at a cost of about $1,500,000. Dermott Shemwell of Lexington, N. C., is president.

BELLEVIEW, FLA.—Arrangements are being made by the Belleview Utilities Company, recently organized, for the construction of an electric light plant, to cost about $10,000. James Conway of Harvard, Ill., is engineer.

SARASOTA, FLA.—Contract has been awarded to the Southern Construction Company of St. Petersburg for the construction of the proposed municipal electric light plant. The cost of the plant with equipment is estimated at about $42,000.

SELMA, ALA.—The Alabama Power Company of Birmingham, which has purchased the plant of the Selma Lighting Company, is planning to erect electric transmission lines from its plant on the Coosa River and this city, a distance of 57 miles.

NEW ORLEANS, LA.—The Interstate Electric Company is planning to erect three large buildings in New Orleans, to cost about $1,500,000. The company deals in electrical appliances and automobile appliances. Percival Stern is president of the company.

HOBART, OKLA.—The City Council is considering calling an election to submit to the voters the proposal to issue $135,000 in bonds to construct a municipal electric light plant. V. V. Long & Company, 605 W. D. Capitol Hill, Oklahoma City, are engineers.

FORT WORTH, TEX.—Contract has been awarded by the Chevrolet Motor Car Company for the erection of an addition to its plant to Butcher, Sweeney & Friedman, Eighth Street, to cost with equipment about $500,000.

HEARNE, TEX.—The city is considering increasing the capacity of the municipal electric light plant and waterworks system.

RIPLEY, TEX.—Bonds to the amount of $150,000 have been voted for a municipal electric light and ice plant.

SAN ANTONIO, TEX.—Bonds to the amount of $150,000 have been voted for the installation of a fire-alarm system. H. Helland is city engineer.

WICHITA FALLS, TEX.—Preliminary work relative to the construction of an interurban electric railway between Wichita Falls and Dallas is under way. Two routes have been surveyed. The proposed road will be about 150 miles long. Electric power stations will be erected at Dallas and Wichita Falls. Fred A. Jones of Dallas is in charge of the work.

Pacific and Mountain States

SPOKANE, WASH.—The Home Telephone Company, 501 Second Street, contemplates the installation of underground and aërial cables in the Glenwood district near Hillyard, to cost about $10,000. H. A. Shearer is engineer.

DURHAM, CAL.—The Durham Light & Power Company has applied to the State Railroad Commission for permission to sell its property to the Pacific Gas & Electric Company. J. A. and Edith P. Foster are owners.

LOS ANGELES, CAL.—Plans are under consideration by the Board of Public Service for the construction of a power plant on South Fork of Kern River, to cost more than $10,000,000. E. F. Scattergood, 645 South Olive Street, is electrical engineer.

MAYFIELD, CAL.—Plans are being considered by the Town Council for an issue of $20,000 in bonds to provide funds for the installation of a new electric distributing system, and $5,000 for a new pump and motor equipment at the municipal waterworks.

ORANGE, CAL.—The city trustees have authorized plans to be prepared for the installation of an oramental street-lighting system on Glasswell Street and Chapman Avenue. About 157 lamp standards will be required.

RAISIN CITY, CAL.—The Fresno County Board of Supervisors has authorized the Raisin City lighting district to continue with its work of street lighting in accordance with the vote recently taken.

REEDLEY, CAL.—Contract has been awarded by the Town Council to the Reedley Electrical Works for the installation of an electrolier lighting system, to cost about $11,800.

BOISE, IDAHO. — Orders have been placed by the Iaho Power Company for equipment for an 8000-hp. addition to its power plant at Thousand Springs on Snake River. Additional improvements, including the installation of control gates and dredging operations, at the Swan Falls power plant have been authorized.

LOGAN, UTAH.—Plans have been prepared by A. H. Chamberlain, engineer, for the installation of an ornamental street-lighting system, to cost about $25,000.

Canada

NIAGARA FALLS, ONT.—The Hydro-Electric Power Commission of Ontario, it is announced, will acquire the electric railway from Niagara Falls and St. Catharines to Toronto as one of the links in the Hydro-Electric system. An addition is to be built to the bridge at Niagara Falls by agreement with the International Bridge Company. This will permit the Canadian hydroelectric system to enter Buffalo. Rights-of-way are now being secured from Bridgeport, Ontario, to Port Colborne and Welland for an extension of the electric lighting and power system.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer of the Panama Canal, Washington, D. C., until Sept. 10 for furnishing steel, iron, brass, bronze, copper, brass tubing, iron or steel rope, copper wire and cable, bolts, rivets, screws, cable thimbles, etc. Blanks and information relating to this circular (1301) may be obtained at the above office.

(Issued Aug. 5, 1919)

1,312,484. APPARATUS FOR OZONE GENERATION; William J. Knox, New York, N. Y. App. filed Jan. 31, 1914. Adaptable.

1,312,494. INDICATING DEVICE FOR ELECTROLYTIC CELLS; Frank G. Wheeler, Appleton, Wis. App. filed May 22, 1916.

1,312,497. TRANSFORMER COIL FOR IGNITION, ETC.; John F. Cavanagh, Meriden, Conn. App. filed May 28, 1918.

1,312,503. VIBRATING CONTACT RELAY FOR ELECTRICAL REGULATORS; Allen A. Tirrill, Pittsburgh, Pa. App. filed Sept. 13, 1916. High-value exciting currents avoided.

1,312,504. THERMIC TELEPHONE; Robert A B. Van Lynden, Utrecht, Netherlands. App. filed May 2, 1916.

(Issued Aug. 12, 1919)

1,312,514. TRUNK-SELECTING SWITCH; John G. Blessing, Chicago, Ill. App. filed Jan. 17, 1912.

1,312,522. RELAY; Burns Dick, St. Louis, Mo. App. filed July 5, 1916.

1,312,537. DIRECTION INDICATOR FOR VEHICLES; Charles A. Harpman, Youngstown, Ohio. App. filed April 15, 1918.

1,312,546. FIXTURE FOR MAGNETIC CHUCKS; Samuel Karasick, New York, N. Y. App. filed June 30, 1917.

1,312,549. ENGINE-STARTING SYSTEM; Charles F. Kettering and William A. Chryst, Dayton, Ohio. App. filed May 25, 1915.

1,312,550. ELECTRIC SWITCH; Charles J. Klein, Milwaukee, Wis. App. filed March 11, 1914. Snap type.

1,312,554. MANIFOLD HEATER; Thomas P. Logan, Columbus, Ohio. App. filed Feb. 17, 1919.

1,312,551. ATTACHMENT PLUG; Charles J. Klein, Milwaukee, Wis. App. filed Aug. 5, 1915. Swivel type.

1,312,558. AUTOMATIC PRIVATE-BRANCH EXCHANGE TELEPHONE SYSTEM; Talbot G. Martin, Chicago, Ill.

1,312,564. ARMATURE-WINDING MECHANISM; Herman C. Mueller, Milwaukee, Wis. App. filed June 1, 1915. Automatic brake.

1,312,572. SECRET SIGNALING SYSTEM; Ralzemond D. Parker, Brooklyn, N. Y. App. filed Sept. 13, 1918.

1,312,574. SECRET SIGNALING SYSTEM; Ralph E. Pierce, Larchmont, N. Y. App. filed Dec. 13, 1918.

1,312,596. TELAUTOGRAPHIC APPARATUS; George S. Tiffany, Summit, N. J. App. filed March 29, 1912.

1,312,602. GUNFIRE-CONTROL APPARATUS; Frank W. Wood, Montclair, N. J. App. filed Nov. 26, 1915.

1,312,604. MEANS FOR TRANSMISSION OF POWER; Joseph L. Woodbridge, Philadelphia, Pa. App. filed April 16, 1917. Light construction.

1,312,622. ELECTRIC GAS LIGHTER; Roy F. Dowdy, Roanoke, Va. App. filed Dec. 22, 1917.

1,312,632. ADVERTISING DEVICE; Hilario Huerta, St. Louis, Mo. App. filed May 31, 1919.

1,312,646. LIGHTNING ARRESTER FOR HIGH-TENSION LINES; Sol S. Sonneborn, Brooklyn, N. Y. App. filed Feb. 10, 1917.

1,312,688. MEASURED-SERVICE TELEPHONE SYSTEM; John Erickson, Chicago, Ill. App. filed July 20, 1917.

1,312,692. MOTION-TRANSMITTING APPARATUS; John C. Hornung, Chicago, Ill. App. filed Oct. 21, 1918. Floating oscillating link.

1,312,697. TROLLEY-WIRE FINDING AND REPLACING DEVICE; Arthur R. Langley, Oakland, Cal. App. filed Dec. 2, 1916. Automatic.

1,312,702. MEASURED-SERVICE TELEPHONE SYSTEM; Talbot G. Martin, Chicago, Ill. App. filed Aug. 8, 1912.

1,312,706. SELECTIVE RINGING TELEPHONE SYSTEM; Michael Schwartz, Chicago, Ill. App. filed Jan. 25, 1912.

1,312,752. SYSTEM OF CONTROL; Lynn G. Riley, Wilkinsburg, Pa. App. filed May 6, 1915.

1,312,753. ELECTRICAL MEASURING INSTRUMENT; Frank W. Roller, East Orange, N. J. App. filed Dec. 15, 1914.

1,312,756. ELECTROLYZER; Jordan H. Stover, Nutley, N. J. App. filed Jan. 12, 1917. Resistance minimized.

1,312,757. RELAY; Walter H. Smith, Wilkinsburg, Pa. App. filed June 13, 1917.

1,312,768. TELEPHONE-EXCHANGE SYSTEM; Dawson M. Taggart, East Orange, N. J. App. filed Nov. 17, 1917.

Record of Electrical Patents

Notes on United States Patents

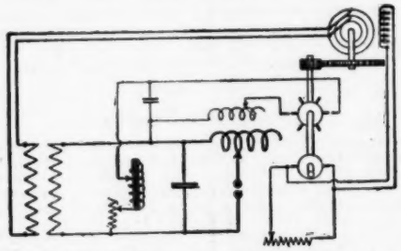
1,312,769. BRUSH-HOLDING DEVICE; Lawrence W. Turnbull, Wilkinsburg, Pa. App. filed Sept. 15, 1914. Wearing reduced.

1,312,773. TELEPHONE-EXCHANGE SYSTEM; Ray S. Wilbur, Jersey City, N. J. App. filed Sept. 25, 1917.

1,312,775. TELEGRAPHIC TYPEWRITER; Orin Bennett, Placerville, Cal. App. filed May 4, 1916.

1,312,777. ELECTRIC SWITCH; George A. Burnham, Saugus, Mass. App. filed March 24, 1915. Fuse connections protected.

1,312,778. TELEPHONE-EXCHANGE SYSTEM; Henry P. Clausen, Mount Vernon, N. Y. App. filed April 13, 1918.



1,312,972—Device for Auxiliary Starting

1,312,785. CONTROL SYSTEM; Rudolf E. Hellmund, Swissvale, Pa. App. filed Nov. 7, 1917. Flashover eliminated.

1,312,786. CONTROL SYSTEM; Rudolf E. Hellmund, Swissvale, Pa. App. filed Sept. 25, 1914. Main field winding energized.

1,312,791. SIGNALING SYSTEM; Alben E. Lundell and Edgar H. Clark, New York, N. Y. App. filed March 30, 1917.

1,312,792. FUSE FOR ELECTRIC SWITCHES; George A. Burnham, Saugus, Mass. App. filed July 1, 1915. Plurality of fuse holders.

1,312,794. AUTOMOBILE MAGNETIC CONTACT; Walter E. McCreary, Altoona, Pa. App. filed Dec. 22, 1918.

1,312,795. TELEPHONE-EXCHANGE SYSTEM; Harry W. MacDougall, East Orange, N. J. App. filed Nov. 24, 1917.

1,312,796. ELECTRICAL PROTECTIVE DEVICE; Paul MacGahan, Pittsburgh, Pa. App. filed July 6, 1917. Selective control.

1,312,800. METHOD FOR MAKING CARBON BISULPHIDE; Hugh K. Moore and George A. Richter, Berlin, N. H. App. filed Nov. 21, 1917.

1,312,808. SIGNALING SYSTEM FOR TELEPHONE EXCHANGES; Ralph L. Quass, Hawthorne, N. J. App. filed Dec. 8, 1916.

1,312,809. SIGNALING SYSTEM; Charles E. Scribner, Jericho, Vt. App. filed June 8, 1917.

1,312,830. ELECTRICALLY HEATED GARMENT; Charles E. Camm, Salt Lake City, Utah. App. filed March 20, 1919.

1,312,835. THERMAL CIRCUIT CLOSER; Thomas L. Corbitt, Johnston City, Ill. App. filed June 22, 1917.

1,312,845. ELECTRIC WELDING MACHINE; James H. Gravell, Philadelphia, Pa. App. filed Jan. 3, 1919. Power factor stabilized.

1,312,884. AUTOMATIC SWITCH-CONTROL CIRCUIT; Samuel B. Williams, Jr., Brooklyn, N. Y. App. filed March 16, 1916. Escape magnet regulated.

1,312,888. TIMING APPARATUS; Charles E. Brandfass, Wheeling, W. Va. App. filed July 15, 1918.

1,312,890. CHARGING SYSTEM FOR STORAGE BATTERIES; Chester I. Hall, Fort Wayne, Ind. App. filed June 8, 1916.

1,312,894. TELEPHONE SYSTEM; Hiram D. Currier, Chicago, Ill. App. filed Jan. 8, 1915.

1,312,895. RELEASE BOX; John H. Derby, New York, N. Y. App. filed Nov. 20, 1915.

1,312,935. ELECTRICAL STEERING GEAR; John D. Williamson, Jr., Philadelphia, Pa. App. filed March 15, 1918.

1,312,946. ELECTRIC CLOCK; Gustav Blumberg and John A. Butkus, Baltimore, Md. App. filed Dec. 23, 1915.

1,312,965. MEASURED-SERVICE TELEPHONE SYSTEM; John Erickson, Chicago, Ill. App. filed Dec. 8, 1917.

1,312,972. DEVICE FOR AUXILIARY STARTING FOR HIGH-POWER RADIO-TELEGRAPHIC STATIONS; Emile Girardeau and Joseph Bethenod, Paris, France. App. filed March 16, 1916.

1,312,983. ELECTRICAL CONDENSER AND MOUNTING THEREFOR; Otto Heins and Charles M. Wild, Southwick, Mass. App. filed Feb. 11, 1918.

1,312,985. TIMER CASING; Frederick C. Hersee, Waltham, Mass. App. filed Sept. 13, 1918.

1,312,991. STARTING SYSTEM FOR ENGINES; August Kazenmaier and Eugene Bauer, Stuttgart, Germany. App. filed Feb. 12, 1916.

1,312,992. ELECTRICAL SPEED INDICATOR; August Kazenmaier, Stuttgart, Germany. App. filed March 12, 1917.

1,313,011. ROLLER GRIZZLY; Leo Pinger, Fallon, Nev. App. filed Aug. 10, 1918.

1,313,019. ELECTRIC SWITCH; William R. Schmitz, Columbus, Ohio. App. filed Feb. 10, 1917. Dual control.

1,313,025. TUBE-FORMING APPARATUS; Charles S. Smith, Milwaukee, Wis. App. filed Dec. 26, 1916. Improved contacts.

1,313,030. ELECTROPNEUMATIC BRAKE; Walter V. Turner, Wilkinsburg, Pa. App. filed Oct. 8, 1918.

1,313,042. WIRELESS SIGNALING SYSTEM; Ernst F. W. Alexanderson, Schenectady, N. Y. App. filed Nov. 26, 1917.

1,313,050. MEANS FOR PREVENTING VOLTAGE FLUCTUATION ON DISTRIBUTION CIRCUITS; John D. Ball, Milwaukee, Wis. App. filed March 27, 1917. Voltage fluctuation reduced.

1,313,051. TEMPERATURE COMPENSATOR FOR ELECTRICAL CONTROL DEVICES; Frederick C. Barton, Fort Wayne, Ind. App. filed Dec. 20, 1916.

1,313,054. MAGNETIC MATERIAL SUITABLE FOR USE IN STATIC TRANSFORMERS AND OTHER ELECTRICAL APPARATUS; Arthur F. Berry, London, Eng. App. filed Jan. 7, 1918.

1,313,070. ELECTRICAL SIGNALING; Louis Cohen, Washington, D. C. App. filed Sept. 7, 1916.

1,313,072. PROTECTION OF TRANSMISSION SYSTEMS; Elmer E. F. Creighton, Schenectady, N. Y. Differential action.

1,313,078. ELECTRIC SHIP PROPULSION; William L. R. Emmet, Schenectady, N. Y. App. filed March 23, 1916.

1,313,079. ELECTRIC SHIP PROPULSION; William L. R. Emmet, Schenectady, N. Y. App. filed March 23, 1916. Interlocking control.

1,313,089. ATTACHMENT PLUG; William Ile, New York, N. Y. App. filed Oct. 11, 1918. Simplified construction.

1,313,092. CIRCUIT INTERRUPTER; Joseph O. Langguth, Wilkinsburg, Pa. App. filed July 12, 1917. Applicable to knife-blade switches.

1,313,093. WIRELESS SIGNALING SYSTEM; Irving Langmuir, Schenectady, N. Y. App. filed March 11, 1916.

1,313,094. SYSTEM FOR AMPLIFYING VARIABLE CURRENTS; Irving Langmuir, Schenectady, N. Y. App. filed Sept. 16, 1918.

1,313,097. CONTROLLING MEANS FOR ENGINE-GENERATOR-DRIVEN VEHICLES; Herman Lemp, Erie, Pa. App. filed Dec. 17, 1918.

1,313,102. ELECTRIC SHIP PROPULSION; Campbell Macmillan, Schenectady, N. Y. App. filed March 15, 1916.

1,313,112. RADIO-TELEPHONE SYSTEM; John H. Payne, Jr., Schenectady, N. Y. App. filed Aug. 28, 1916.

1,313,117. CONSTANT-CURRENT REGULATOR; Hugh D. Sanborn, Swampscott, Mass. App. filed Nov. 5, 1917. Adjustable.

1,313,120. PLUG RECEPTACLE FOR USE WITH RUGS; Howard R. Sargent, Schenectady, N. Y. App. filed Dec. 6, 1917.